



Environmental Assessment

SOUTH CENTRAL LIGHT RAIL EXTENSION

November 2016



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SOUTH CENTRAL LIGHT RAIL EXTENSION ENVIRONMENTAL ASSESSMENT

Prepared in accordance with:

- National Environmental Policy Act of 1969 (42 USC § 4332 et seq.), as amended
- Federal Transit Act (49 USC § 5301 et seq.), as amended
- Fixing America's Surface Transportation (FAST) Act (Public Law 114-94)

By the:

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CONTENTS

EXECUTIVE SUMMARY.....	ES-1
ES.1 WHAT IS THE SOUTH CENTRAL LIGHT RAIL EXTENSION AND WHERE IS IT LOCATED?	ES-1
ES.2 WHY WAS THE ENVIRONMENTAL ASSESSMENT WRITTEN AND WHAT DOES IT INCLUDE?	ES-2
ES.3 WHY IS THE PROJECT NEEDED AND WHAT ISSUES WOULD IT ADDRESS?	ES-9
ES.4 WHAT ALTERNATIVES HAVE BEEN CONSIDERED AND HOW DID WE GET TO THE PROJECT NOW PROPOSED?	ES-10
ES.5 WOULD THERE BE ANY ADVERSE ENVIRONMENTAL IMPACTS?..	ES-13
ES.6 HOW MUCH WOULD THE PROJECT COST AND HOW WOULD IT BE FUNDED?	ES-25
Capital Costs Funding Sources	ES-25
Operating Costs Funding Sources	ES-26
1.0 INTRODUCTION AND PURPOSE AND NEED FOR THE PROPOSED PROJECT	1-1
1.1 WHAT IS THE PROPOSED PROJECT AND WHY IS AN ENVIRONMENTAL ASSESSMENT BEING PREPARED?	1-1
1.2 WHY IS HIGH-CAPACITY TRANSIT NEEDED IN THE STUDY AREA?	1-4
1.2.1 Improving the Reliability of Transit Service in the South Central Avenue Corridor	1-5
1.2.2 Improving Mobility for Low-income, Minority and Transit- dependent Populations.....	1-5
1.2.3 Addressing Existing and Future Transit Capacity Issues	1-6
1.2.4 Supporting Current and Planned Economic and Transit-oriented Development in the Build Alternative Corridor as Identified in the City's 2015 General Plan.....	1-7
1.2.5 Enhancing Access from the South Mountain Village Core and the Ed Pastor Transit Center to Regional Employment Centers and Activity Destinations	1-7
1.3 WHAT IS THE PURPOSE OF THE PROPOSED BUILD ALTERNATIVE?	1-8
1.4 WHAT ARE THE GOALS FOR THE PROPOSED BUILD ALTERNATIVE?	1-9
2.0 ALTERNATIVES TO THE PROPOSED PROJECT	2-1
2.1 WHAT ALTERNATIVES HAVE BEEN CONSIDERED AND HOW DID WE GET TO THE ALTERNATIVES SELECTED FOR EVALUATION IN THIS EA?	2-1
2.1.1 Tier 1 Screening.....	2-1

2.1.2	Tier 2 Screening	2-7
2.1.3	Refinement of the Leading Alternative Subsequent to Tier 2	2-9
2.2	WHAT ALTERNATIVES ARE EVALUATED IN THIS ENVIRONMENTAL ASSESSMENT?	2-11
2.2.1	No-Build Alternative	2-11
2.2.2	BUILD ALTERNATIVE	2-17
3.0	ENVIRONMENTAL IMPACTS—WHAT IMPACTS ARE LIKELY TO OCCUR AND HOW WILL ADVERSE IMPACTS BE AVOIDED OR MINIMIZED?	3-1
3.1	LAND ACQUISITION AND RELOCATION	3-2
3.1.1	Environmental Setting	3-2
3.1.2	No-Build Alternative	3-2
3.1.3	Build Alternative	3-3
3.1.4	Mitigation	3-11
3.2	EXISTING LAND USE	3-16
3.2.1	Environmental Setting	3-16
3.2.2	No-Build Alternative	3-17
3.2.3	Build Alternative	3-20
3.2.4	Mitigation	3-21
3.3	CONSISTENCY WITH LOCAL PLANS	3-21
3.3.1	Environmental Setting	3-21
3.3.2	No-Build Alternative	3-21
3.3.3	Build Alternative	3-22
3.3.4	Mitigation	3-23
3.4	ECONOMIC EFFECTS	3-23
3.4.1	Environmental Setting	3-24
3.4.2	No-Build Alternative	3-24
3.4.3	Build Alternative	3-25
3.4.4	Mitigation	3-28
3.5	GROWTH AND GROWTH-INDUCED IMPACTS	3-28
3.5.1	Environmental Setting	3-28
3.5.2	No-Build Alternative	3-28
3.5.3	Build Alternative	3-29
3.5.4	Mitigation	3-29
3.6	TRAFFIC/PARKING/PEDESTRIANS/BICYCLES/FREIGHT ROUTES/ TRANSIT	3-29
3.6.1	Environmental Setting	3-29
3.6.2	No-Build Alternative	3-35
3.6.3	Build Alternative	3-36
3.6.4	Mitigation	3-49
3.7	AIR QUALITY AND GREENHOUSE GASES	3-51
3.7.1	Environmental Setting	3-51
3.7.2	No-Build Alternative	3-54
3.7.3	Build Alternative	3-54

3.7.4 Mitigation	3-58
3.8 NOISE AND VIBRATION	3-59
3.8.1 Environmental Setting	3-59
3.8.2 No-Build Alternative	3-68
3.8.3 Build Alternative	3-68
3.8.4 Mitigation	3-87
3.9 ENERGY REQUIREMENTS AND POTENTIAL FOR CONSERVATION	3-91
3.9.1 Environmental Setting	3-91
3.9.2 No-Build Alternative	3-93
3.9.3 Build Alternative	3-93
3.9.4 Mitigation	3-95
3.10 HISTORICAL AND ARCHAEOLOGICAL PROPERTIES	3-95
3.10.1 Environmental Setting	3-95
3.10.2 No-Build Alternative	3-109
3.10.3 Build Alternative	3-112
3.10.4 Measures to Avoid and Minimize Effects	3-115
3.11 SECTION 4(f) AND SECTION 6(f) EVALUATION	3-117
3.11.1 Environmental Setting	3-117
3.11.2 No-Build Alternative	3-120
3.11.3 Build Alternative	3-120
3.11.4 Measures to Minimize Harm	3-126
3.12 VISUAL AND AESTHETICS	3-127
3.12.1 Environmental Setting	3-127
3.12.2 No-Build Alternative	3-133
3.12.3 Build Alternative	3-134
3.12.4 Mitigation	3-136
3.13 COMMUNITY IMPACTS	3-137
3.13.1 Environmental Setting	3-137
3.13.2 No-Build Alternative	3-139
3.13.3 Build Alternative	3-139
3.13.4 Mitigation	3-140
3.14 ENVIRONMENTAL JUSTICE	3-140
3.14.1 Environmental Setting	3-140
3.14.2 Identification of Potential Adverse Effects and Measures to Avoid, Minimize and/or Mitigate	3-145
3.14.3 Benefits	3-149
3.14.4 Public Engagement	3-150
3.14.5 Determination of Whether Environmental Justice Populations Would Be Subjected to Disproportionately High and Adverse Effects	3-151
3.15 HAZARDOUS MATERIALS	3-151
3.15.1 Environmental Setting	3-151
3.15.2 No-Build Alternative	3-162

3.15.3 Build Alternative	3-162
3.15.4 Mitigation.....	3-164
3.16 SAFETY AND SECURITY MEASURES	3-165
3.16.1 Environmental Setting	3-165
3.16.2 No-Build Alternative.....	3-166
3.16.3 Build Alternative	3-166
3.16.4 Mitigation.....	3-168
3.17 WETLANDS, NAVIGABLE WATERS AND FLOODPLAINS	3-168
3.17.1 Environmental Setting	3-168
3.17.2 No-Build Alternative.....	3-170
3.17.3 Build Alternative	3-170
3.17.4 Mitigation.....	3-174
3.18 WATER QUALITY.....	3-175
3.18.1 Environmental Setting	3-175
3.18.2 No-Build Alternative.....	3-176
3.18.3 Build Alternative	3-177
3.18.4 Mitigation.....	3-178
3.19 ECOLOGICALLY SENSITIVE AREAS/THREATENED AND ENDANGERED SPECIES	3-179
3.19.1 Environmental Setting	3-179
3.19.2 No-Build Alternative.....	3-181
3.19.3 Build Alternative	3-181
3.19.4 Mitigation.....	3-184
3.20 CONSTRUCTION	3-185
3.20.1 Environmental Setting	3-185
3.20.2 No-Build Alternative.....	3-185
3.20.3 Build Alternative	3-185
3.20.4 Measures to Minimize Short-Term Construction Impacts.....	3-191
3.21 CUMULATIVE IMPACTS.....	3-195
3.21.1 Environmental Setting	3-195
3.21.2 No-Build Alternative.....	3-195
3.21.3 Build Alternative	3-198
3.21.4 Mitigation.....	3-199
4.0 WHO ARE THE AGENCIES AND PERSONS CONSULTED?	4-1
4.1 INTRODUCTION	4-1
4.2 SUMMARY OF PUBLIC INVOLVEMENT ACTIVITIES.....	4-1
4.3 COMMUNITY OUTREACH BY STUDY PHASE.....	4-2
4.3.1 Alternatives Analysis Outreach Activities	4-3
4.3.2 Community Working Group	4-4
4.3.3 EA Scoping and Outreach Activities.....	4-5
4.4 BOARDS/COMMITTEES/CITY COUNCIL.....	4-6
4.5 ADDITIONAL STAKEHOLDER MEETINGS	4-7

4.6 PUBLIC REVIEW OF THE ENVIRONMENTAL ASSESSMENT.....	4-9
5.0 HOW MUCH WILL THE PROPOSED BUILD ALTERNATIVE COST AND HOW WILL IT BE FUNDED?	5-1
6.0 SOURCES AND REFERENCES CITED.....	6-1

TABLES

TABLE ES-1: SOUTH CENTRAL LIGHT RAIL EXTENSION AT-A-GLANCE.....	ES-5
TABLE ES-2: BUILD ALTERNATIVE ENVIRONMENTAL IMPACTS SUMMARY ..	ES-13
TABLE ES-3: ESTIMATED CAPITAL COSTS AND FUNDING SOURCES.....	ES-26
TABLE ES-4: ESTIMATED ANNUAL OPERATING COSTS AND FUNDING SOURCES.....	ES-26
TABLE 1-1: STUDY AREA DEMOGRAPHIC COMPARISON, 2013.....	1-6
TABLE 1-2: STUDY AREA COMMUTE TO WORK MODE COMPARISON, 2013	1-6
TABLE 2-1: TIER 1 ALTERNATIVES CARRIED FORWARD FOR STUDY IN TIER 2	2-6
TABLE 2-2: TIER 2 SCREENING MAJOR FINDINGS.....	2-9
TABLE 2-3: ROADWAY PROJECTS – NO-BUILD ALTERNATIVE.....	2-12
TABLE 2-4: NO-BUILD ALTERNATIVE TRANSIT NETWORK.....	2-13
TABLE 2-5: EXISTING AND PLANNED TRANSIT FACILITIES IN STUDY AREA....	2-17
TABLE 2-6: SOUTH CENTRAL LIGHT RAIL EXTENSION AT-A-GLANCE	2-19
TABLE 2-7: PLANNED STATION LOCATION, BY TYPE	2-28
TABLE 2-8: BUILD ALTERNATIVE TRANSIT NETWORK	2-37
TABLE 3-1: TRACK, STATIONS AND ROADWAY RIGHT-OF-WAY NEEDS.....	3-4
TABLE 3-2: TRACTION POWER SUBSTATION AND SIGNAL HOUSE RIGHT- OF-WAY NEEDS	3-12
TABLE 3-3: PARK-AND-RIDE RIGHT-OF-WAY NEEDS.....	3-13
TABLE 3-4: CONSTRUCTION STAGING AREA RIGHT-OF-WAY NEEDS	3-14
TABLE 3-5: 7TH AVENUE AND INTERSTATE 17 RIGHT-OF-WAY NEEDS.....	3-15
TABLE 3-6: LAND USE WITHIN ONE-HALF MILE OF ALIGNMENT AND STATION AREAS	3-17
TABLE 3-7: SUMMARY OF LOCAL PLANS	3-22
TABLE 3-8: CONSISTENCY WITH LOCAL PLANS	3-23
TABLE 3-9: ANTICIPATED EFFECTS OF THE BUILD ALTERNATIVE ON TAX REVENUES AND EMPLOYMENT	3-27
TABLE 3-10: LOCAL AND CIRCULATOR BUS TRANSIT ROUTES – 2015 CONDITIONS	3-33
TABLE 3-11: REGIONAL BUS TRANSIT ROUTES – 2015 CONDITIONS	3-34
TABLE 3-12: INTERSECTION LEVEL OF SERVICE AND DELAY (PM PEAK).....	3-37

TABLE 3-13: INTERSECTIONS OPERATING AT SAME LOS IN 2015 CONDITIONS, NO-BUILD ALTERNATIVE AND BUILD ALTERNATIVE	3-39
TABLE 3-14: ON-STREET PARKING INVENTORY AND IMPACTS FOR NORTH-TO-SOUTH STREETS.....	3-44
TABLE 3-15: ON-STREET PARKING INVENTORY AND IMPACTS FOR EAST- TO-WEST STREETS.....	3-44
TABLE 3-16: STUDY INTERSECTIONS – MITIGATION.....	3-49
TABLE 3-17: HIGHEST MODELED CO CONCENTRATIONS (PPM)	3-56
TABLE 3-18: PROJECTED VEHICLE MILES TRAVELED AND CO ₂ EMISSIONS IN MARICOPA COUNTY, ARIZONA	3-58
TABLE 3-19: FEDERAL TRANSIT ADMINISTRATION NOISE IMPACT CRITERIA.....	3-66
TABLE 3-20: SUMMARY OF NOISE IMPACT ASSESSMENT FOR CATEGORY 2.....	3-69
TABLE 3-21: SUMMARY OF NOISE IMPACT ASSESSMENT FOR CATEGORY 3.....	3-74
TABLE 3-22: SUMMARY OF VIBRATION IMPACT ASSESSMENT FOR CATEGORY 2.....	3-80
TABLE 3-23: SUMMARY OF VIBRATION IMPACT ASSESSMENT FOR CATEGORY 3.....	3-85
TABLE 3-24: RECOMMENDED NOISE MITIGATION	3-89
TABLE 3-25: VIBRATION MITIGATION FOR SENSITIVE RECEIVERS.....	3-90
TABLE 3-26: ENERGY CONSUMPTION FACTORS.....	3-92
TABLE 3-27: FORECAST ANNUAL VEHICLE MILES TRAVELED AND ESTIMATED ENERGY CONSUMPTION, BY ALTERNATIVE	3-93
TABLE 3-28: PREVIOUSLY DOCUMENTED ARCHAEOLOGICAL SITES IN THE APE	3-105
TABLE 3-29: HISTORIC PROPERTIES AND DISTRICTS LISTED AND ELIGIBLE FOR LISTING IN THE APE.....	3-109
TABLE 3-30: <i>DE MINIMIS</i> IMPACTS ON SECTION 4(f) RESOURCES.....	3-121
TABLE 3-31: COMPARISON OF CHARACTERISTICS BY VISUAL UNIT	3-130
TABLE 3-32: VISUAL IMPACTS DEFINITION AND MITIGATION GUIDELINES	3-132
TABLE 3-33: VIEWER TYPES AND VISUAL IMPACTS SENSITIVITY	3-133
TABLE 3-34: EXISTING VISUAL QUALITY, BY UNIT	3-133
TABLE 3-35: IMPACTS, BY VISUAL UNIT	3-136
TABLE 3-36: MINORITY AND LOW-INCOME POPULATIONS.....	3-145
TABLE 3-37: HIGH-RISK POTENTIAL SITES OF CONCERN	3-158
TABLE 3-38: MODERATE-RISK POTENTIAL SITES OF CONCERN.....	3-159
TABLE 3-39: LOW-RISK POTENTIAL SITES OF CONCERN.....	3-161
TABLE 3-40: INDETERMINATE-RISK POTENTIAL SITES OF CONCERN.....	3-161

TABLE 3-41: PROPERTIES FOR ADDITIONAL HAZARDOUS MATERIALS EVALUATION	3-163
TABLE 3-42: WELLS WITHIN 100 FEET OF THE STUDY AREA.....	3-176
TABLE 3-43: FEDERALLY LISTED OR PROTECTED SPECIES WITH POTENTIAL TO OCCUR IN THE STUDY AREA	3-184
TABLE 3-44: BUILD ALTERNATIVE CONSTRUCTION ACTIVITIES.....	3-186
TABLE 3-45: CONSTRUCTION NOISE GUIDELINES	3-188
TABLE 3-46: PREDICTED CONSTRUCTION NOISE AT 50 FEET.....	3-189
TABLE 3-47: OPTIONS TO MINIMIZE CONSTRUCTION DURATION	3-191
TABLE 3-48: CONSTRUCTION-RELATED IMPACTS/MITIGATION MEASURES..	3-192
TABLE 3-49: CURRENT AND FUTURE DEVELOPMENT PROJECTS	3-196
TABLE 3-50: CUMULATIVE IMPACTS ANALYSIS	3-198
TABLE 4-1: OBJECTIVES OF THE PUBLIC INVOLVEMENT PLAN.....	4-1
TABLE 4-2: STAFF AND AGENCY MEETINGS	4-2
TABLE 4-3: GENERAL PUBLIC MEETINGS	4-4
TABLE 4-4: COMMUNITY WORKING GROUP MEETINGS	4-5
TABLE 4-5: BOARD AND COMMITTEE MEETINGS	4-6
TABLE 4-6: ADDITIONAL STAKEHOLDER MEETINGS	4-7
TABLE 5-1: ESTIMATED CAPITAL COSTS AND FUNDING SOURCES.....	5-1
TABLE 5-2: ESTIMATED ANNUAL OPERATING COSTS AND FUNDING SOURCES	5-1

FIGURES

FIGURE ES-1: VALLEY METRO HIGH-CAPACITY TRANSIT CORRIDORS	ES-1
FIGURE ES-2: BUILD ALTERNATIVE.....	ES-3
FIGURE ES-3: OPERATIONS AND MAINTENANCE CENTER IMPROVEMENTS	ES-4
FIGURE ES-4: ALTERNATIVES DEVELOPMENT PROCESS	ES-10
FIGURE ES-5: COMPARISON OF TRANSIT MODES CONSIDERED	ES-11
FIGURE 1-1: VALLEY METRO HIGH-CAPACITY TRANSIT CORRIDORS.....	1-2
FIGURE 1-2: SOUTH CENTRAL LIGHT RAIL EXTENSION STUDY AREA	1-3
FIGURE 1-3: OPERATIONS AND MAINTENANCE CENTER EXPANSION AREA.....	1-4
FIGURE 2-1: MODAL ALTERNATIVES CONSIDERED	2-2
FIGURE 2-2: TIER 1 ALIGNMENTS	2-3
FIGURE 2-3: ALTERNATIVE ALIGNMENTS CARRIED INTO TIER 2	2-8
FIGURE 2-4: NO-BUILD ALTERNATIVE TRANSIT NETWORK – LOCAL SERVICE	2-15
FIGURE 2-5: NO-BUILD ALTERNATIVE TRANSIT NETWORK – REGIONAL SERVICE.....	2-16

FIGURE 2-6: BUILD ALTERNATIVE.....	2-18
FIGURE 2-7: BUILD ALTERNATIVE LOOPS	2-24
FIGURE 2-8: TYPICAL CROSS SECTION – MID-BLOCK (MARICOPA FREEWAY [I-17] TO SHERMAN ST)	2-24
FIGURE 2-9: TYPICAL CROSS SECTION – SIGNAL LOCATION (MARICOPA FREEWAY [I-17] TO SHERMAN ST)	2-25
FIGURE 2-10: TYPICAL CROSS SECTION – MID-BLOCK (BASELINE RD TO SALT RIVER)	2-25
FIGURE 2-11: TYPICAL CROSS SECTION – SIGNAL LOCATION (BASELINE RD TO SALT RIVER)	2-26
FIGURE 2-12: TYPICAL CROSS SECTION – INTERSECTION AT SIGNAL (SOUTHERN AVE, BROADWAY RD, BUCKEYE RD)	2-26
FIGURE 2-13: TYPICAL CROSS SECTION – INTERSECTION AT STATION (SOUTHERN AVE, BROADWAY RD, BUCKEYE RD)	2-27
FIGURE 2-14: TYPICAL CROSS SECTION – INTERSECTION AT STATION (ROESER RD)	2-27
FIGURE 2-15: TYPICAL CROSS SECTION – INTERSECTION AT STATION (BASELINE RD – END-OF-LINE)	2-28
FIGURE 2-16: TYPICAL FLARED INTERSECTION.....	2-30
FIGURE 2-17: MODERN ROUNDABOUTS – SALT LAKE CITY LIGHT RAIL	2-31
FIGURE 2-18: OPERATIONS AND MAINTENANCE CENTER EXPANSION	2-34
FIGURE 2-19: BUILD ALTERNATIVE TRANSIT NETWORK – LOCAL SERVICE.....	2-35
FIGURE 2-20: BUILD ALTERNATIVE TRANSIT NETWORK – REGIONAL SERVICE.....	2-36
FIGURE 3-1: EXISTING LAND USE ALONG CENTRAL AVENUE	3-18
FIGURE 3-2: EXISTING LAND USE AT MCKINLEY STREET LOOP AND OPERATIONS AND MAINTENANCE CENTER	3-19
FIGURE 3-3: INTERSECTIONS EVALUATED – NORTHERN SECTION	3-31
FIGURE 3-4: INTERSECTIONS EVALUATED – SOUTHERN SECTION	3-32
FIGURE 3-5: INTERSECTIONS NEEDING MITIGATION	3-50
FIGURE 3-6: NOISE AND VIBRATION TEST SITES AND SENSITIVE RECEIVERS – DOWNTOWN	3-60
FIGURE 3-7: NOISE AND VIBRATION TEST SITES AND SENSITIVE RECEIVERS – BUCKEYE ROAD TO SALT RIVER	3-61
FIGURE 3-8: NOISE AND VIBRATION TEST SITES AND SENSITIVE RECEIVERS – ELWOOD STREET TO ROESER ROAD	3-62
FIGURE 3-9: NOISE AND VIBRATION TEST SITES AND SENSITIVE RECEIVERS – SUNLAND AVENUE TO BASELINE ROAD	3-63
FIGURE 3-10: TYPICAL NOISE LEVELS	3-64
FIGURE 3-11: STANDARD FROG.....	3-87

FIGURE 3-12: AREA OF POTENTIAL EFFECTS – NORTHERN PORTION OF CORRIDOR.....	3-98
FIGURE 3-13: AREA OF POTENTIAL EFFECTS – SOUTHERN PORTION OF CORRIDOR.....	3-99
FIGURE 3-14: AREA OF POTENTIAL EFFECTS – OPERATIONS AND MAINTENANCE CENTER	3-100
FIGURE 3-15: SECTION 4(f) AND SECTION 6(f) RESOURCES ADJACENT TO THE BUILD ALTERNATIVE	3-119
FIGURE 3-16: VISUAL ASSESSMENT UNITS.....	3-129
FIGURE 3-17: COMMUNITY FACILITIES IN THE STUDY AREA.....	3-138
FIGURE 3-18: STUDY AREA PERCENTAGE MINORITY POPULATION COMPARISON.....	3-143
FIGURE 3-19: STUDY AREA PERCENTAGE LOW-INCOME POPULATION COMPARISON.....	3-144
FIGURE 3-20: POTENTIAL SITES OF CONCERN, WASHINGTON STREET TO MOHAVE STREET	3-154
FIGURE 3-21: POTENTIAL SITES OF CONCERN, INTERSTATE 17 TO SOUTH OF SALT RIVER.....	3-155
FIGURE 3-22: POTENTIAL SITES OF CONCERN, BROADWAY ROAD TO SOUTH OF ROESER ROAD	3-156
FIGURE 3-23: POTENTIAL SITES OF CONCERN, SOUTHERN AVENUE TO BASELINE ROAD	3-157
FIGURE 3-24: FLOODPLAIN/FLOODWAY HAZARD ZONES ALONG THE BUILD ALTERNATIVE	3-171
FIGURE 3-25: FLOODPLAIN HAZARD ZONES NEAR OPERATIONS AND MAINTENANCE CENTER	3-172
FIGURE 3-26: RETROFIT OF THE CENTRAL AVENUE BRIDGE PIER FOOTERS.....	3-173
FIGURE 3-27: TEMPORARY IMPACTS ON WOUS.....	3-174
FIGURE 3-28: CURRENT AND FUTURE DEVELOPMENT PROJECTS.....	3-197

APPENDICES

APPENDIX A. CONCEPTUAL ENGINEERING PLANS

APPENDIX B. ECONOMIC DEVELOPMENT TECHNICAL MEMORANDUM

APPENDIX C. TRANSPORTATION TECHNICAL REPORT

APPENDIX D. AIR QUALITY TECHNICAL REPORT

APPENDIX E. NOISE AND VIBRATION TECHNICAL REPORT

APPENDIX F. CULTURAL RESOURCE INVENTORY AND EVALUATION

APPENDIX F1. DRAFT MEMORANDUM OF AGREEMENT

APPENDIX G. SECTION 4(f) AND SECTION 6(f) TECHNICAL MEMORANDUM

APPENDIX H. VISUAL AND AESTHETICS TECHNICAL MEMORANDUM

APPENDIX I. ENVIRONMENTAL JUSTICE TECHNICAL MEMORANDUM

APPENDIX J. PHASE I ENVIRONMENTAL SITE ASSESSMENT

APPENDIX K. SAFETY AND SECURITY TECHNICAL MEMORANDUM

APPENDIX L. BIOLOGICAL ASSESSMENT

APPENDIX L1. U.S. FISH AND WILDLIFE SERVICE LETTER

APPENDIX M. LIST OF PREPARERS

APPENDIX N. COMMENTS RECEIVED ON THE DRAFT EA
AND RESPONSES

ACRONYMS AND ABBREVIATIONS

AA	Alternatives Analysis
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AGFD	Arizona Game and Fish Department
AM	morning
APE	area of potential effects
ASM	Arizona State Museum
ASU	Arizona State University
AZPDES	Arizona Pollutant Discharge Elimination System
BA	biological assessment
BRT	bus rapid transit
BTU	British thermal unit
CFR	Code of Federal Regulations
CHPO	City Historic Preservation Office
CO	carbon monoxide
CO ₂	carbon dioxide
CT	census tract
CWA	Clean Water Act
CWG	Community Working Group
dB	decibel
dBA	A-weighted decibel
EA	environmental assessment
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Environmental Site Assessment
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
ft.	feet
FTA	Federal Transit Administration
FY	fiscal year

GBN	groundborne noise
GBV	groundborne vibration
GHG	greenhouse gas
HCT	high-capacity transit
I-17	Interstate 17
in.	inch
Ldn	day-night equivalent sound level
Leq	equivalent sound level
Lmax	maximum sound level
LOS	level of service
LRT	light rail transit
LSD	Logan Simpson Design
LUST	leaking underground storage tank
LWCF	Land and Water Conservation Fund
MAG	Maricopa Association of Governments
MOE	Maintenance of Equipment
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 ₁₀	particulate matter equal to or smaller than 10 microns
PM _{2.5}	particulate matter equal to or smaller than 2.5 microns
ppm	parts per million
PSI	Preliminary Site Investigation
ROW	right-of-way

RSHRA	Rio Salado Habitat Restoration Area
RTP	<i>Regional Transportation Plan</i>
sq ft.	square feet
SHPO	Arizona State Historic Preservation Office
SIP	State Implementation Plan
SO ₂	sulfur dioxide
SR	State Route
SWCA	SWCA, Inc., Environmental Consultants
SWPPP	Stormwater Pollution Prevention Plan
TCE	temporary construction easement
TCP	traditional cultural property
TIP	Transportation Improvement Program
TPSS	traction power substation
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDOT	U.S. Department of Transportation
USFWS	U.S. Fish and Wildlife Service
UST	underground storage tank
VdB	vibration decibels
VMT	vehicle miles traveled
WOUS	waters of the United States

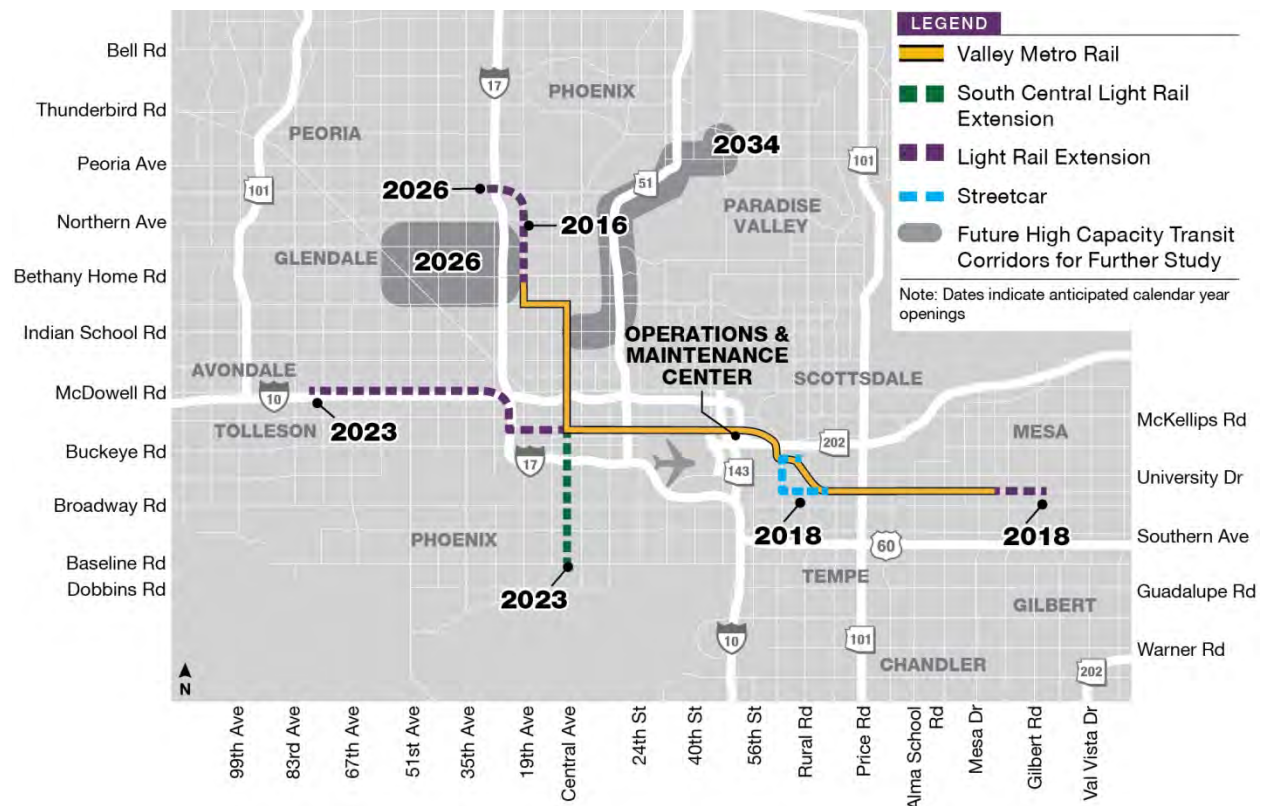
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EXECUTIVE SUMMARY

ES.1 WHAT IS THE SOUTH CENTRAL LIGHT RAIL EXTENSION AND WHERE IS IT LOCATED?

Valley Metro, in cooperation with the City of Phoenix and the Federal Transit Administration (FTA), proposes to construct the South Central Light Rail Extension Project in Phoenix, Arizona. The project is in the fiscally constrained adopted *Regional Transportation Plan* (RTP). Although the South Central Light Rail Extension Project was not originally a part of the 2004 voter-approved RTP's concept to build 57 miles of high-capacity transit (HCT) improvements in the Maricopa Association of Governments (MAG) region, it was formally approved by the MAG Regional Council as a major amendment to the 2035 RTP in June 2015. Figure ES-1 displays the proposed Build Alternative's route in relation to Valley Metro's 23-mile light rail line and other planned HCT corridor improvements.

FIGURE ES-1: VALLEY METRO HIGH-CAPACITY TRANSIT CORRIDORS



Public and stakeholder outreach began in spring 2012 and is ongoing. Since 2012, more than 20 general public meetings and a substantial number of smaller stakeholder meetings have been held (for more information, see Chapter 4.0).

Between 2012 and 2014, Valley Metro, in cooperation with the City of Phoenix and FTA, conducted an Alternatives Analysis (AA) to analyze potential HCT improvements in the South Central Avenue corridor. The AA included extensive public and stakeholder outreach and analyzed a wide range of alignment and modal alternatives.

In 2014, the Phoenix City Council adopted the locally preferred alternative for a 5-mile light rail transit project from the existing light rail system in Downtown Phoenix to Baseline Road along Central Avenue.

The Build Alternative evaluated in this environmental assessment (EA) would extend light rail service approximately 5 miles south from the existing Valley Metro light rail line in Downtown Phoenix to Baseline Road (Figure ES-2). The route would connect with the existing line at Washington and Jefferson Streets using a one-way couplet, with southbound operations on 1st Avenue and northbound operations on Central Avenue, before converging at Hadley Street to operate within the Central Avenue median in two directions to its terminus at Baseline Road.

The Build Alternative would serve South Phoenix neighborhoods and activity centers and would provide a direct link to the existing regional Valley Metro light rail system and the major transit center at Central Station in Downtown Phoenix. In addition to the many neighborhoods along South Central Avenue, the Build Alternative would serve St. Vincent de Paul, Nina Mason Pulliam Rio Salado Audubon Center, Ed Pastor Transit Center, Travis L. Williams Family Services Center and Jesse Owens Memorial Medical Center.

The Build Alternative also includes the McKinley Street and Central Avenue loops and expansion of the Operations and Maintenance Center within its existing property boundaries (Figure ES-3). Table ES-1 summarizes the light rail extension's primary features. The South Central Light Rail Extension Project is scheduled to begin operations in 2023. For more information, see Chapter 2.0 of this EA.

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

Valley Metro will seek federal funding from FTA for the Build Alternative. 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 for Implementing the Procedural Provisions of the National Environmental Policy Act (40 Code of Federal Regulations [CFR] 1500–1508) and the joint FTA/Federal Highway Administration Environmental Impact and Related Procedures (23 CFR 771). FTA serves as the lead federal agency under NEPA. Valley Metro is the project sponsor and participated with FTA as a joint lead agency consistent with 23 CFR 771.109(c)(2) and 23 United States Code 139(c)(3) 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 list of agencies and persons consulted. This document serves as a tool for FTA and Valley Metro to identify potentially significant impacts on social, economic and environmental resources and to identify measures that can avoid, minimize or mitigate such impacts.

FIGURE ES-2: BUILD ALTERNATIVE

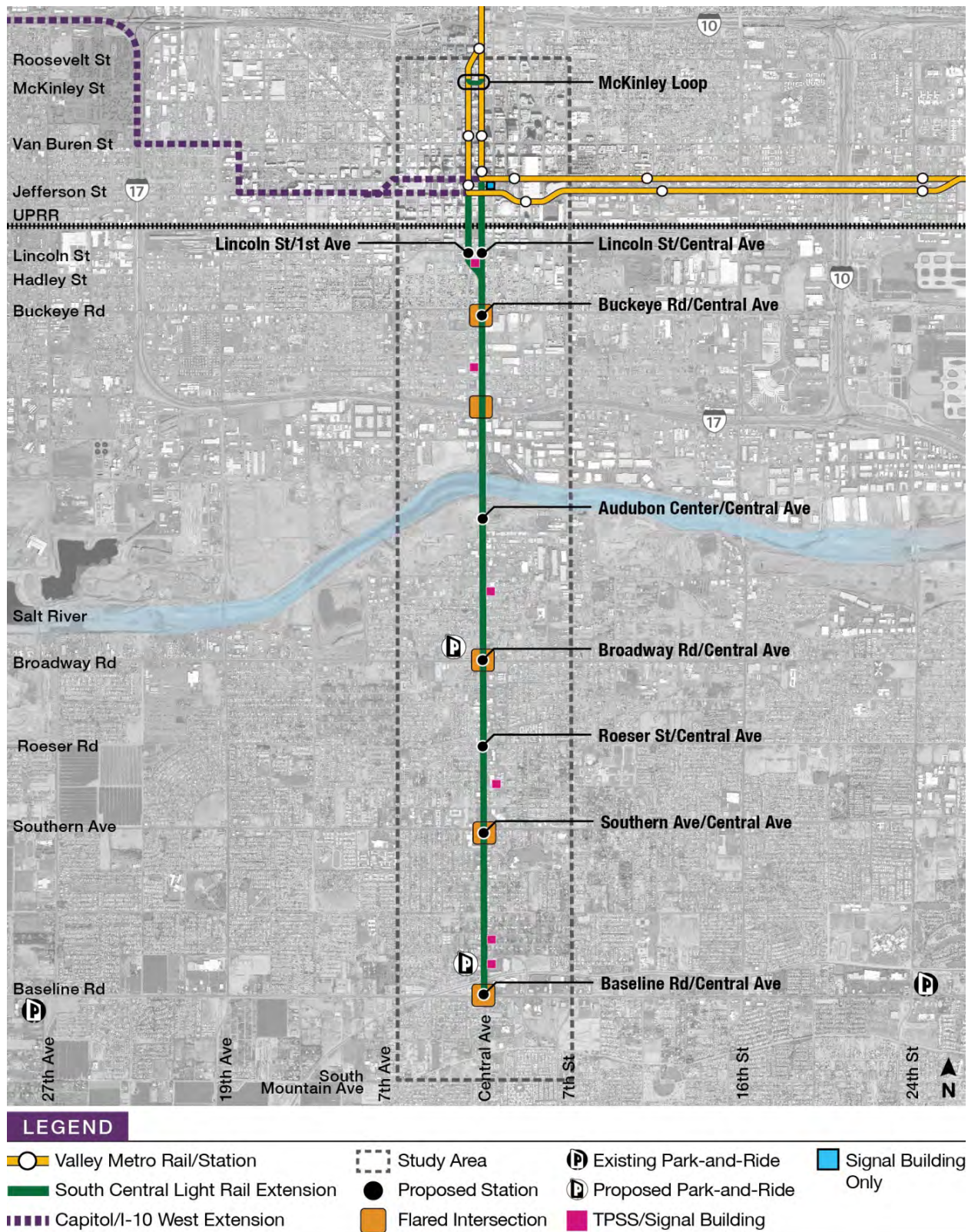


FIGURE ES-3: OPERATIONS AND MAINTENANCE CENTER IMPROVEMENTS

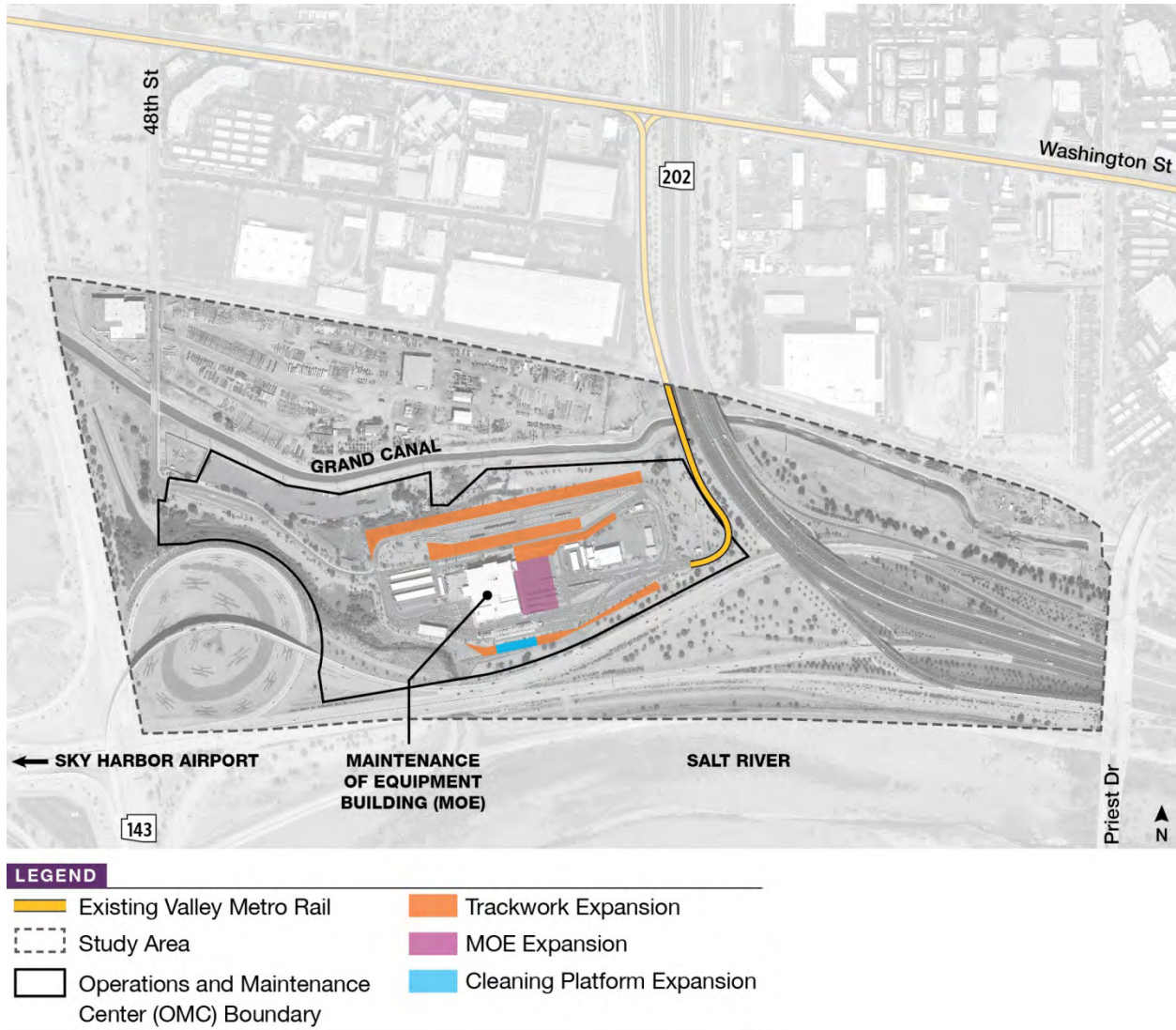


TABLE ES-1: SOUTH CENTRAL LIGHT RAIL EXTENSION AT-A-GLANCE

Feature	Description
From – To:	<u>Central Ave and 1st Ave (one-way couplet); Washington St/Jefferson St (from connection with existing light rail) to Hadley St</u> – This section has a single-track configuration. <u>Central Ave – Hadley St to Baseline Rd</u> – This section has a double-track configuration.
Route distance	Approximately 5 miles
Daily ridership	6,690 ^a
Operations begin	2023
Construction timing and duration	• Timing: 2019 to 2023 • Duration: Approximately 4 years
Trackwork	• Southbound: Side-running track along 1st Ave south of Jefferson St to Lincoln St; transitions to median-running along 1st Ave to Hadley St; follows the 1st Ave one-way couplet curve to the east to rejoin Central Ave and continues median-running to Baseline Rd • Northbound: Median-running track from Baseline Rd to Buchanan St; side-running track between Buchanan St and Madison St; transitions to median-running from Madison St to Jefferson St; transitions back to side-running to connect into existing station north of Jefferson St • Typically at grade except where both the northbound and southbound tracks and roadway go under Union Pacific Railroad and Jackson St (between Buchanan St and Madison St) • Continuously welded steel rails • Track rails embedded in a concrete slab for aesthetic purposes and to provide level and smooth crossings for automobiles and pedestrians where such crossings are allowed <u>Special trackwork</u> • Loop at McKinley St/1st Ave and McKinley St/Central Ave (northern portion of the study area) – provides operational flexibility during special events and in case of track closures by allowing the train to switch tracks • Loop near Sherman St (south of Grant St) to allow trains to change tracks and/or direction • Crossover tracks at Central Ave/Jefferson St to allow light rail vehicle nonrevenue service to operate to the Operations and Maintenance Center near 48th St and Washington St • Crossover tracks to facilitate movement of trains to opposite track at following locations: Sherman St, Cocopah St, Raymond St, Cody Dr, Sunland Ave and Fremont Road/Jesse Owens Pkwy • Central Ave/Baseline Rd station would have four tracks: two for loading and unloading passengers on the station platform in both directions and two outside tracks for temporary train storage

Feature	Description
Stations	Eight new stations would be provided at: - Lincoln St/1st Ave (southbound) - Lincoln St/Central Ave (northbound) - Buckeye Rd/Central Ave - Audubon Center/Central Ave - Broadway Rd/Central Ave - Roeser St/Central Ave - Southern Ave/Central Ave - Baseline Rd/Central Ave (southern terminus) The light rail extension would tie into the existing light rail tracks just south of the existing stations at Washington St/Central Ave (northbound operations) and Jefferson/1st Ave (southbound operations). Here, the South Central trains would interline with the existing light rail line and continue north to serve all existing stations between Washington St/Jefferson St and the line's terminus at Dunlap Ave/19th Ave.
Light rail vehicles	18 – consists of 15 revenue service vehicles and 3 spare vehicles - Vehicle specifications similar to Valley Metro's existing fleet for system operability - Carry approximately 175 passengers per vehicle - Average operating speed of approximately 20 miles per hour, with a maximum speed of 35 miles per hour - Could operate as a two- or three-car train depending on demand (two-car train would be the most common configuration)
Traffic lanes	Light rail would operate in semiexclusive guideway separate from vehicular traffic, except at signal-protected intersections, which would require changes in the configuration of traffic lanes as follows: <u>Southbound</u> 1st Ave from Jefferson St to Lincoln St, including the pass under the Jackson St bridge and Union Pacific Railroad (UPRR) bridge, traffic lanes reduced from three through lanes to two through lanes with turn pockets at minor signalized intersections 1st Ave from Lincoln St to Hadley St, traffic lanes reduced from two through lanes to one through lane with left-turn pocket at minor signalized intersection - Central Ave from Hadley St to Apache St, traffic lanes reduced from two in each direction to one in each direction with left-turn pockets at minor signalized intersections - Central Ave from approximately Apache St to Watkins St, including the pass under the Interstate 17 (I-17) bridge, two through traffic lanes maintained each direction with left turn pocket at I-17 frontage roads - Central Ave from Watkins St to Baseline Rd, including the Salt River bridge and Western Canal bridge, traffic lanes reduced from two in each direction to one in each direction with left-turn pockets at minor signalized intersections - At Buckeye Rd/Central Ave, Broadway Rd/Central Ave, Southern Ave/Central Ave and Baseline Rd/Central Ave, intersections flare to include one through lane, one dedicated left-turn lane and one shared lane for bicycles and right turns

Feature	Description
Traffic lanes (continued)	<u>Northbound</u> - Central Ave from Baseline Rd to Watkins St, including the Salt River bridge and Western Canal bridge, traffic lanes reduced from two in each direction to one in each direction with left-turn pockets at minor signalized intersections - Central Ave from approximately Watkins St to Apache St, including the pass under the I-17 bridge, two through traffic lanes maintained each direction with left-turn pocket at I-17 frontage roads - Central Ave from Apache St to Lincoln St, traffic lanes reduced from two through lanes to one in each direction with left-turn pockets at minor signalized intersections - Central Ave from Lincoln St to Madison St, including the pass under the UPRR bridge and the Jackson St bridge, traffic lanes reduced from three through lanes to two through lanes - Central Ave from Madison St to Jefferson St, traffic lanes reduced from three through lanes to two dedicated right-turn lanes - Central Ave from Jefferson St to Washington St, including the pass under the CityScape pedestrian bridge, roadway closed to through traffic - Flared intersections as described for the southbound direction <u>Roundabouts</u> - Central Ave at Victory St - Central Ave just south of the Salt River in front of the Audubon Center <u>I-17 Frontage Roads</u> - Relocation of frontage roads away from the Interstate 17 bridge
Sidewalks/ Bicycle routes	- Sidewalks to be maintained as currently exist - The Build Alternative would maintain bicycle routes as they currently exist, with some reconfiguration. In some locations the bicycle lane would share right-of-way (ROW) with the dedicated right-turn lane and, in others, bicycle lanes may shift to the opposite side of the street. - The Build Alternative would add the following bicycle lanes to provide continuous bicycle facilities along the alignment: - Southbound on 1st Ave between Madison St and Lincoln St - Southbound on Central Ave between Riverside St and Broadway Rd - Southbound and northbound (both directions) on Central Ave between Southern Ave and Baseline Rd
Bridge modifications at Salt River	- Remove and replace center portion of bridge deck and concrete girders so that the current bridge can support the additional periodic weight of light rail vehicles. - Reduce travel lanes from two in each direction to one in each direction to accommodate the light rail vehicles and trackwork. - Thicken each existing bridge pier footing with concrete. - Replace existing abutments with a new cap beam/column substructure element.
Headways	12-minute frequency in each direction for most of the day, and 20 minutes during late night and early morning hours. Headways by time period are presented below: 5 a.m.–6 a.m.: 20 minutes 6 a.m.–7 p.m.: 12 minutes 7 p.m.–12 a.m.: 20 minutes 12 a.m.–3 a.m.: 20 minutes (Friday and Saturday only)

Feature	Description
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.)
Overhead catenary system	Distributes electricity to light rail vehicles, traction power substations (TPSSs) and signaling and communication systems: - Steel poles support power line: - Pole height: about 25 feet - Pole spacing: typically 90 to 170 feet - Poles normally located between the two bidirectional tracks; sometimes located on the side of the light rail trackway with the overhead electrical line suspended over the light rail tracks
TPSSs	- Supply electricity for light rail operations - Approximate site right-of-way requirements: - Structure: 25 by 47 feet - Total site (access, utilities, setbacks, etc.): 65 by 90 feet - Six TPSS sites being considered; only five would be selected: - Northwestern corner Central Ave/Hadley St - Northwestern corner Central Ave/Cocopah St - Southeastern corner Central Ave/Raymond St - Northeastern corner Central Ave/Sunland Ave - Northeastern corner Central Ave/Carter Rd - Southeastern corner Central Ave/Jesse Owens Pkwy
Signal buildings	- Generally combined with TPSSs, with the exception of a signal building only near Central Ave and Jefferson St at CityScape^b - Signal building without TPSS approximate site requirements: - Structure: 16 by 39 feet - Total site: 56 by 80 feet - Signal building combined with TPSS: - Structure: 25 by 65 feet - Total site: 65 by 105 feet
Operations and maintenance	Existing Valley Metro Operations and Maintenance Center, southeast of 41st St/ Washington St, would be expanded to include: - Seven new storage tracks to increase vehicle storage capacity - A second cleaning platform - Expansion of the Maintenance of Equipment building including modifications or extension of the existing mezzanine, office space, inspection pits and cranes - All improvements accommodated within the footprint of the existing Operations and Maintenance Center; no additional property would be acquired

Feature	Description
Park-and-ride	- Broadway Rd/Central Ave: A 70- to 80-space park-and-ride lot to be built on City of Phoenix-owned property adjacent to the Ed Pastor Transit Center - Baseline Rd/Central Ave: An optional approximately 365 space park-and-ride lot would be constructed on the western side of Central Ave just south of Fremont Rd. Additionally, passengers could use the existing park-and-ride lots west and east of this location at 27th Ave/Baseline Rd and 24th St/Baseline Rd, respectively; local Routes 77 and 77B would provide frequent service (15 minutes all day) between the park-and-rides and the light rail terminus at Baseline Rd/Central Ave

^a FTA Stops projection daily linked trips on Build Alternative for 2013

^b This signal house is in a dense urban environment that is continually changing. During final design, the location of the signal house would be determined. As is typical in this type of environment, the signal house would likely be located in an existing parking structure, basement or utility vault.

A synopsis of the EA chapters is presented below. This section summarizes the information provided in the EA. For additional information on a specific topic, refer to the EA chapters below.

Chapter 1.0: 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 Build Alternative, the need for mobility improvements and the goals for the Build Alternative.

Chapter 2.0: 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 two alternatives evaluated in this EA: the No-Build and Build Alternatives.

Chapter 3.0: Environmental Impacts – Describes the anticipated impacts associated with the No-Build and Build Alternatives. Potential mitigation measures are identified for adverse impacts.

Chapter 4.0: Who Are the Agencies and Persons Consulted? – Describes the community outreach process and specific stakeholders and others consulted as part of the Build Alternative development.

Chapter 5.0: 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 6.0: 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 1.0 of this EA. The Build Alternative is needed to:

- Improve the reliability of transit service in the South Central Avenue corridor
- Improve mobility for low-income, minority and highly transit-dependent populations
- Address transit capacity issues for meeting existing and projected population and employment growth in the corridor.

- Support current and planned economic and transit-oriented development in the South Central corridor as identified in the City's 2015 General Plan
- Enhance access from the South Mountain Village core and the Ed Pastor Transit Center to regional employment centers and activity destinations such as Downtown Phoenix, the North Central Avenue employment center, Phoenix Sky Harbor International Airport and the Arizona State University Main and Downtown campuses

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

Valley Metro, in cooperation with the City of Phoenix and FTA, conducted an AA between 2012 and 2014 to analyze potential HCT improvements within the South Central Light Rail Extension corridor. The AA included extensive public and stakeholder outreach and analyzed a wide range of alignment and modal alternatives. For more information, see Chapter 2.0 in this EA.

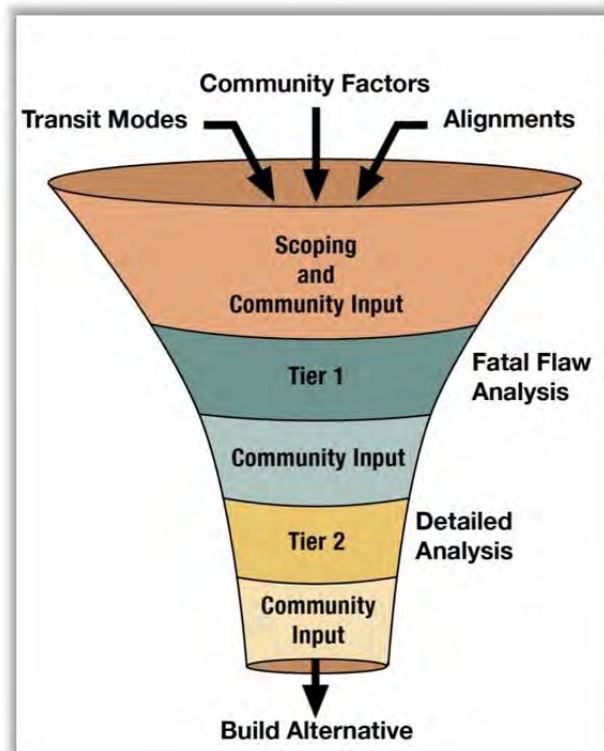
In September 2014, the City of Phoenix adopted a preferred alternative for further evaluation in this EA. Several alternatives were developed during the AA process and were evaluated with the following major points in mind:

- Meet the purpose and need for the South Central Light Rail Extension
- Address travel markets in the study area
- Minimize environmental impacts
- Respond to agency and community input

A two-tiered alternatives development process (Figure ES-4) was used to evaluate alternatives and incorporate input from a wide variety of individual stakeholders, the community and agencies. Chapter 2.0 of this EA presents additional information about the AA; Chapter 4.0 provides more information about community outreach and 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 (light rail, bus rapid transit [BRT] and modern streetcar—Figure ES-5) with a central objective of identifying “fatal flaws.” The second phase (Tier 2) evaluated in more detail the remaining alternatives.

Eleven alternative alignments were considered in the Tier 1 screening. The alternative alignments considered used portions of 7th Avenue, 1st Avenue, Central

FIGURE ES-4: ALTERNATIVES DEVELOPMENT PROCESS



Avenue and 7th Street to travel south from Downtown Phoenix, eventually rejoining Central Avenue at Hadley Street, Lincoln Street, Buckeye Road, Mohave Street or Broadway Road. All alternatives considered featured two-way service from Broadway to Baseline Roads. The Valley Metro team, along with City of Phoenix staff, recognized early on that no alternative could succeed without serving the South Mountain Village core, focused along Central Avenue between Broadway and Baseline Roads, with its hub near the intersection of Central Avenue and Broadway Road—the location of the Ed Pastor Transit Center. Therefore, every alignment alternative used Central Avenue from Broadway Road south to Baseline Road. Each of the three technologies was considered for each of the 11 alignments developed, resulting in 33 combinations of potential alignment and technology alternatives evaluated in the Tier 1 screening.

FIGURE ES-5: COMPARISON OF TRANSIT MODES CONSIDERED

	Light Rail Transit	Modern Streetcar	Bus Rapid Transit
Purpose / Market Type	Higher-speed, high-demand regional connections	Moderate-speed, moderate-demand local or regional connections	Higher-speed, high-demand local or regional connections
Operating Environment	Dedicated or semi-dedicated guideway	Semi-dedicated guideway or arterial streets in mixed traffic	Semi-dedicated guideway or arterial streets in mixed traffic
Spacing of Stops	Approximately every one-half to one mile or longer	Approximately every one-fourth to one-half mile	Approximately every one-half to one mile or longer
Passenger Capacity per Vehicle	Approximately 180-200 per car	Approximately 130-160 per car	Approximately 60-90 per bus
Flexible Routing	No	No	Yes
High Economic Development Potential	Yes	Yes	No
			

Valley Metro selected the following criteria to screen both the modal and alignment alternatives evaluated in the Tier 1 screening:

- Potential for new ridership
- Physical and engineering constraints
- Transit-oriented land use and economic development potential
- Transportation network integrity and functionality
- Costs (capital and operating)

As a result of the screening, the following eight combinations of alignments and modes were selected for further, more detailed evaluation in the Tier 2 analysis:

- **Alignments 1 and 2** (Central and 1st Avenues) using any of the three modes (light rail, BRT and modern streetcar) for Alignment 1 and using light rail or modern streetcar for Alignment 2. These were the most highly rated of any of the alternatives.
- **Alignment 5** (7th Avenue from Buckeye Road north to the light rail line Downtown connection) using all three modes considered.

Despite the Tier 1 recommendation to carry forward both rail modes for Alignment 1 using Central Avenue northbound and 1st Avenue southbound under the Union Pacific Railroad, these two modes were not evaluated for this alignment in Tier 2 because the preliminary investigation at the beginning of the Tier 2 screening concluded that the vertical clearance (height) of the Central Avenue underpass at the Union Pacific Railroad and Jackson Street would prevent either rail mode from traveling through the underpass without modifying the structure.

The alternatives selected for Tier 2 evaluation were subjected to a more detailed analysis that included specific performance measures to compare the following factors: mobility improvements, access improvements, traffic impacts, right-of-way impacts, environmental impacts, land use and economic development impacts, capital costs, operating and maintenance costs, cost effectiveness (in other words, how the cost of the alternative compares with its ridership), operating efficiencies and community support.

Based on features such as ability to attract the highest ridership, interline with the existing and planned METRO light rail system, support development and redevelopment opportunities and garner community support, the light rail mode was selected as the preferred transit mode over modern streetcar and BRT.

Alignments 1 and 2 would both traverse locations with the greatest potential to attract high ridership, garner high community support and positively influence local land use and development.

The 7th Avenue alignment had little community support, posed complications with the interline of existing and future light rail lines, required a long detour to Central Avenue that would discourage patronage and would have required extensive residential property acquisitions and relocations. For these reasons, light rail using Alignment 2 was recommended as the likely preferred alternative to carry forward after the Tier 2 screening. Alignment 1 was also carried forward as a possible “variant” to Alignment 2 pending further investigation.

Subsequent to the Tier 2 screening, a more detailed evaluation of the Central Avenue underpass—which crosses under the Union Pacific Railroad and Jackson Street—concluded that a light rail train could operate on Central Avenue through the underpass without modifying the existing structures. In addition, use of Central Avenue for northbound light rail operations could benefit from travel time savings compared with operating northbound service on 1st Avenue between Hadley and Jackson Streets. Another major advantage of the northbound Central Avenue alignment is that it eliminated the need for a contraflow northbound operation on 1st Avenue.

Therefore, Alignment 2 (1st Avenue north of Hadley Street) was eliminated in favor of Alignment 1 (1st Avenue/Central Avenue one-way couplet north of Hadley Street). The

Phoenix City Council and Valley Metro Board of Directors concurred with the recommendation (in December 2013 and September 2014, respectively), and Alignment 1 using light rail became the preferred alternative for more detailed study in this EA.

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 3.0 of this EA, and noted in Table ES-2, have determined that, with implementation of the proposed mitigation measures where needed, the Build Alternative would not result in an adverse effect with mitigation, except for archaeological resources. A Memorandum of Agreement with the State Historic Preservation Office will be prepared, prior to the completion of the NEPA process, to resolve any adverse effects to archaeological resources.

TABLE ES-2: BUILD ALTERNATIVE ENVIRONMENTAL IMPACTS SUMMARY

Issue	Discussion
<i>Land Acquisition and Relocation</i>	
Impact	<u>Right-of-way (ROW) for guideway, stations, park-and-rides and traffic mitigation on 7th Ave and Interstate 17</u> Total parcels affected: 126 Full acquisition (parcels): 5 Partial acquisition (parcels): 121 Business relocations: 1 Partial buildings affected (that is, cut and reface): 2 Residence relocations: 0 <u>Total parcels under consideration/potentially affected for traction power substations (TPSSs): 8</u> Potential full acquisition (parcels): 1 Partial acquisition (parcels): 7 (however, since only 5 of the 6 TPSS sites would be chosen, it is likely 5 to 6 partial acquisitions would be needed) Business relocations: 0 Signal house on City of Phoenix-owned land: 1 parcel (no impact) Residence relocations: 0 With implementation of mitigation measures, no adverse impact would occur.
Mitigation	- 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. - 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.
<i>Consistency with Existing Land Uses and Local Plans</i>	
Impact	No adverse impact; Build Alternative is consistent.
Mitigation	Not applicable

Issue	Discussion
<i>Economic Effects and Growth-inducing Impacts</i>	
Impact	No adverse impact; Build Alternative is generally positive.
Mitigation	Not applicable
<i>Traffic</i>	
Impact	The proposed Build Alternative would have no adverse impacts on intersections along Central Ave or 1st Ave; however, with the lane reduction on Central Ave, three intersections on 7th St and 7th Ave would operate at an unacceptable level of service without mitigation. With implementation of mitigation measures, no adverse impact would occur.
Mitigation	During design, Valley Metro would include improvements to the following intersections to reduce traffic impacts: 7th St and Interstate 17: Add a northbound right-turn lane in addition to existing through shared right lane, restripe eastbound through right as exclusive right and optimize signal timing. 7th Ave and Interstate 17: Add a northbound right-turn lane, southbound right-turn lane and optimize signal timing. 7th Ave and Southern Ave: Add a westbound right-turn lane, southbound right-turn lane and optimize signal timing.
<i>Parking</i>	
Impact	<u>On-street parking spaces displaced</u> North-to-south streets: 5 East-to-west streets: 0 (Build Alternative would add 16 spaces on northern side of Jefferson St between 1st Ave and Central Ave) Ample on-street parking opportunities exist in the study area; therefore, no adverse impacts to on-street parking would occur. <u>Off-street parking spaces displaced: 109</u> <u>Off-street parking</u> would be displaced in seven areas along the 5-mile corridor. The lots are generally underused. In the event that sufficient parking may not exist in a lot, ample off-street parking or unmarked curb parking on adjacent side streets is available close to any of these affected parking lots. The Build Alternative would not adversely affect the supply of parking.
Mitigation	Not applicable
<i>Loading Zones</i>	
Impact	A loading zone on the eastern side of 1st Ave between Jefferson St and Madison St would be displaced. The building that the loading zone serves is currently vacant. The loading zone is approximately 25 feet in length, which can accommodate a small pickup-sized truck but not most commercial delivery-sized trucks. The loading zone would not need to be replaced since sufficient capacity exists in the alley adjacent to the building affected by the lost loading zone to accommodate daily loading/unloading activities.
Mitigation	Not applicable

Issue	Discussion
<i>Pedestrians and Bicyclists</i>	
Impact	The Build Alternative would maintain or upgrade pedestrian facilities such as ramps, sidewalks, crosswalks and other Americans with Disabilities Act-compliant provisions. Additionally, pedestrian signals would be added at all proposed signalized intersections near light rail stations. The Build Alternative would retain the existing bicycle lanes and would add bicycle lanes in several locations where none currently exist to provide continuous bicycle facilities in both directions on 1st Ave/Central Ave from Madison St to Baseline Rd. To accomplish this would require new bicycle lanes at the locations noted In Table ES-1. The Build Alternative would have beneficial impacts on pedestrians and bicycles. No adverse impacts would occur.
Mitigation	Not applicable
<i>Truck Routes</i>	
Impact	No truck routes exist in the study area; however, the arterial streets accommodate trucks. With the presence of light rail on Central Ave, a traditional signalized intersection would be unable to accommodate truck U-turns; therefore, roundabouts at Central Ave and Pioneer St and at Central Ave and Victory St are included in the Build Alternative design; therefore, no adverse impacts to truck routes would occur.
Mitigation	Not applicable
<i>Air Quality and Greenhouse Gases</i>	
Impact	The Build Alternative is not a project of air quality concern and would 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 Build Alternative would not result in adverse impacts on air quality. The Build Alternative would support development and proposed commercial and residential redevelopment by encouraging higher-density land uses that would reduce vehicle miles traveled and, as a result, greenhouse gas emissions. Furthermore, the Build Alternative would support City of Phoenix plans and policies to reduce greenhouse gas emissions. Therefore, no adverse impact related to greenhouse gas emissions would occur.
Mitigation	Not applicable
<i>Transit</i>	
Impact	Duplicative bus service to the proposed light rail along the route would be reduced or eliminated. Travel times through the South Central corridor are likely to be faster than the No-Build Alternative because of implementation of priority signaling for light rail. The Build Alternative would provide a new, convenient and reliable transit option for passengers living and working in the study area and would enhance regional transit connectivity and access. No adverse impacts on transit would occur.
Mitigation	Not applicable

Issue	Discussion
Noise and Vibration	
Impact	Impact thresholds are based on the Federal Transit Administration's (FTA's) Noise and Vibration Assessment Methodology (2006). <u>Noise</u> FTA defines two noise level thresholds: moderate and severe; they are based on a comparison of the noise levels for the Build Alternative to existing noise levels. Additional information regarding specific threshold criteria for various noise levels can be found in Section 3.8.1.3. Noise impacts with less than a 1-decibel (dB) exceedance of a moderate impact level would not require mitigation (for example, train bells at low level settings and safety-related). A less than 1-dB change in noise level with the Build Alternative is negligible given that 3 dB is considered the threshold at which an average listener can detect a change. Two homes at 7252 and 7246 S Central Ave would be close to special trackwork and would be adversely affected by noise. Two homes at 7 and 13 E Raymond St would be located close to special trackwork and a proposed traction power substation (TPSS) site and would be adversely affected by noise. With implementation of mitigation measures, no adverse noise impact to these homes would occur. <u>Vibration</u> FTA's thresholds for vibration impact are 72 vibration decibels (VdB) for residential and 78 VdB for institutional land uses. Impacts have been identified at the following locations because of the proximity of trackwork, special trackwork or groundborne noise: • Hotel Palomar • Barrister Place • Salvation Army Adult Rehabilitation Center • Revealed Word Church • Phoenix Collegiate Academy • 1001 to 1009 S Central Ave • 3716 S Central Ave • S Central Ave and W Cody Dr • 7252 S Central Ave (1st row) • 7246 S Central Ave • Arizona Summit Law School • Maricopa County Justice Courts With implementation of mitigation measures, no adverse effects would occur.
Mitigation	Valley Metro would be responsible for ensuring that the following mitigation measures would be included in the proposed Build Alternative's final design: <u>Noise</u> • Install low-impact frogs for the special trackwork at 7252, 7246 S Central Ave and at 7 and 13 E Raymond St. • Orient the TPSS near 7 and 13 E Raymond St so that the cooling fans are as far from the nearest homes as possible. If, during final design, it is discovered that there is no flexibility to orient the TPSS, a sound enclosure would be built around the TPSS.

Issue	Discussion
Mitigation (cont.)	<u>Vibration</u> • Install isolated slab track in front of: - Hotel Palomar - Barrister Place. • Install low-impact frogs at special trackwork near the following locations: - 3716 S Central Ave - S Central Ave and W Cody Dr - 7252 S Central Ave (1st row) - 7246 S Central Ave - Salvation Army Adult Rehabilitation Center - Revealed Word Church - Phoenix Collegiate Academy • Install rail boots at: - Arizona Summit Law School - Maricopa County Justice Courts - 1001 to 1009 S Central Ave.
<i>Energy Requirements and Potential for Conservation</i>	
Impact	The operation of the light rail vehicles would consume energy. However, this energy use would be offset by energy savings associated with a reduction in vehicle miles traveled and the increase in people using transit instead of driving. No adverse energy impacts would occur.
Mitigation	Not applicable
<i>Historical and Archaeological Properties</i>	
Impact	<u>Archaeological Resources</u> Four archaeological sites are in the area of potential effects (APE), and all are eligible for the National Register of Historic Places (National Register) under Criterion D: • Adverse effect to AZ T:12:73(ASM), Pueblo Viejo and AZ T:12:187(ASM), Canal Seven • No adverse effect to AZ T:12:70(ASM), Pueblo Patricio, but would require monitoring given its boundary's proximity to the Build Alternative • No adverse effect to AZ T:12:42(ASM), the Original Phoenix Townsite There would be an adverse effect to Pueblo Viejo and Canal Seven; however, with the implementation of mitigation measures, the impact would be minimized. <u>Historic Resources</u> Sixty National Register-eligible historical properties are within the APE for the Build Alternative. Fifteen parcels containing historical buildings would require minor right-of-way (ROW) acquisitions; however, this would not adversely affect their features or ability to convey historical significance. Indirect effects would include visual, noise and vibration impacts. <u>Visual effects:</u> No indirect adverse effects would result from visual intrusion. <u>Noise effects:</u> While noise impacts would occur, they would not affect the character or setting of the historic properties and thus would not diminish their eligibility for the National Register. <u>Vibration effects:</u> It is not anticipated that operation or construction vibration would be at levels to damage buildings; however, as a precautionary measure, preconstruction surveys of historical buildings would be conducted.

Issue	Discussion
Mitigation	Prior to the Federal Transit Administration issuing a decision document for the Build Alternative, Valley Metro and the Federal Transit Administration would work with the State Historic Preservation Office, the Phoenix City Historic Preservation Office, Native American Tribes and other consulting parties to prepare and execute a Section 106 Memorandum of Agreement (MOA) and to develop and implement a Treatment Plan to resolve the adverse effects of the Build Alternative on historic properties. Native American Tribes would be included in the development and implementation of the MOA and Treatment Plan and subsequent research, fieldwork and interpretation of results, especially at it pertains to the collection and dissemination of data that will contribute to the collective traditional knowledge of Native American Tribes culturally affiliated with the study area. The Treatment Plan would include the following: • Archaeological testing and data recovery at Pueblo Viejo/AZ T:12:73(ASM) and Canal Seven/AZ T:12:187(ASM). • Procedures for any discovery situations, including the treatment of human remains. • Monitoring at Pueblo Patricio/AZ T:12:70(ASM). • Although no adverse ground-borne noise or vibration impacts to historical properties are anticipated as a result of the light rail construction or operation (and thus mitigation is not warranted), Valley Metro would document the existing conditions of historical properties within 200 feet of the construction zone as a baseline for monitoring potential architectural or structural changes to those properties.
Section 4(f) and Section 6(f) Resources	
Impact	The Build Alternative would result in a direct use of 15 different Section 4(f) resources (historic properties) through ROW takes. The acquisition of ROW within the historic property would not adversely affect the architectural features or ability of the buildings and/or structures to convey their historical significance. Therefore, the direct use of these Section 4(f) properties would be <i>de minimis</i>. Proximity impacts on Section 4(f) properties: <u>Access:</u> No impacts to existing access; however, the Build Alternative would enhance access to Section 4(f) resources near the alignment by allowing transit riders within the region served by the light rail system to use a convenient and reliable transportation option to access the Section 4(f) resources in the project corridor. <u>Visual:</u> The Build Alternative would introduce new visual elements (for example, stations, guideway, overhead poles and wires); however, these elements would be consistent with the existing urban setting and so would not adversely affect the visual setting or impair activities, features, or attributes of the property that qualify the resource for protection under Section 4(f). Therefore, no constructive use of these properties would occur. <u>Noise:</u> While potential moderate noise impacts from the Build Alternative have been identified in the area of the Goemmer House (7246 S Central Ave) and Central Hotel (4216 S Central Ave), a quiet setting is not a recognized feature or attribute of the sites' historic significance; therefore, no constructive use of these properties would occur.

Issue	Discussion
Impact (cont.)	<u>Vibration:</u> Special trackwork near the locations listed below would not result in vibration impacts so severe as to damage the structures and thus diminish the qualities that make these historic properties eligible for the National Register; therefore, no constructive use of these properties would occur. - Goemmer House (7246 S Central Ave) - Jefferson Hotel (101 S Central Ave) - Cate Drugs (1001 S Central Ave) - Firpo House (1009 S Central Ave) No temporary occupancies of any Section 4(f) resources would occur. No Section 6(f) resources are within or adjacent to the Build Alternative; therefore, no impacts to Section 6(f) resources would occur.
Mitigation	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: - Access to Section 4(f) properties would be maintained at all times. - Although no adverse vibration impacts resulting in building damage to the Luhrs Tower, Luhrs Building or Barrister Place are anticipated, Valley Metro would perform preconstruction building surveys to document their existing conditions to create a baseline for monitoring potential architectural or structural changes to the properties. - Installation of low-impact frogs in special trackwork near the following locations to reduce the predicted vibration levels to levels below FTA's criteria thresholds for annoyance: - Goemmer House (7246 S Central Ave) - Jefferson Hotel (101 S Central Ave) - Cate Drugs (1001 S Central Ave) - Installation of a rail boot near Firpo House (1009 S Central Ave) to reduce the vibration to levels below FTA's criteria thresholds for annoyance.
Visual and Aesthetics	
Impact	The Build Alternative is in an existing transportation corridor in an urban area; therefore, the Build Alternative would have a low impact on the study area's urban character.
Mitigation	Not applicable
Community Impacts	
Impact	The 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.
Mitigation	Not applicable
Environmental Justice	
Impact	No disproportionately high and adverse impact on low-income or minority populations would occur.
Mitigation	Not applicable

Issue	Discussion
<i>Hazardous Materials</i>	
Impact	A Phase I Environmental Site Assessment (ESA) identified 21 high-risk, 19 moderate-risk, 7 low-risk and 2 indeterminate-risk sites along the Build Alternative. Risk refers to the potential risk of encountering the sites during construction, which, in turn, relates to the potential risk of human exposure to contaminants. Most hazardous materials sites in the corridor are related to service stations and dry cleaners. Potential contaminants associated with these uses include hydrocarbons, heavy metals and dry cleaning solvents. Contact with these contaminants may adversely affect the health of workers or members of the public exposed to the contaminant (for example, respiratory distress/failure and kidney, nervous system and brain damage). Impacts on humans vary, depending on the contaminant and the concentrations encountered. Procedures exist to mitigate, remediate or otherwise nullify the impacts of exposure to hazardous materials. Twenty-two sites along the Build Alternative are recommended for additional investigation to verify the presence of hazardous materials and refine mitigation measures. These sites have known or suspected contamination and/or other details associated with their regulatory listing and/or have the historical presence of service stations, dry cleaners and industrial facilities in the area. The Motorola 52nd Street Superfund Site extends beneath the northern end of the Build Alternative; however, groundwater is too deep to be affected by Build Alternative. No supply wells are within or adjacent to the Build Alternative and are, therefore, not of concern. Given the age of construction of most buildings and transportation features in the study area, it is likely that lead-based paint and asbestos-containing building materials are present in three buildings (1831 S Central Ave, 2125 S Central Ave, 722 S Central Ave) in the main corridor: one associated with the TPSSs (1524 S Central Ave) and two bridges (Jackson St bridge and Central Ave bridge). With implementation of mitigation measures, no adverse impacts are expected from the Build Alternative.
Mitigation	- Valley Metro would perform Preliminary Site Investigations (PSIs) at 22 sites to verify the presence of hazardous materials and refine mitigation. As part of the PSIs, drilling, sampling and a targeted analytical program would be performed to determine the severity and extent of contaminants, if present, that would likely be disturbed by the project. - The City of Phoenix would conduct parcel-specific Phase I ESAs for properties identified for full or partial acquisition (prior to acquisition of the property) to verify impacts and refine mitigation. Depending on results of the Phase I ESAs and the extent of ground-disturbing activities, a Phase II ESA may be required to further delineate potential contamination and to guide construction activities. - Environmental construction monitoring should be conducted along the entire length of the Build Alternative, at the intersections of 7th Ave and Interstate 17 and 7th St and Interstate 17 during signal head relocation.

Issue	Discussion
Mitigation (cont.)	- 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 conform to Valley Metro's Master Specifications 01.35.30, Unknown Hazardous and Contaminated Substances, which, in addition to stopping construction, require that 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 Code of Federal Regulations Part 1910 (Hazardous Waste Operations and Emergency Response) and Part 1926 (Personal Protective Equipment) and Arizona Administrative Code Title 18, Environmental Quality. - Valley Metro would assess building materials and weight-bearing structures (bridges) that would be disturbed by construction for asbestos and lead-based paint prior to construction. Depending on the results of the assessment of specific structures/features, abatement of these materials prior to demolition or alteration would be required. - Valley Metro would develop and implement specific Hazardous Materials Management Plans and/or Abatement Plans (for lead-based paint and asbestos-containing building materials) following results of the PSI investigation and asbestos/lead paint assessments.
Safety and Security	
Impact	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, no adverse impact would occur.
Mitigation	Not applicable
Wetlands, Waters of the United States and Floodplains	
Impact	The Build Alternative crosses through the Salt River, a water of the United States (WOUS) under the jurisdiction of the U.S. Army Corps of Engineers (USACE). Within the Salt River lies the Rio Salado Habitat Restoration Area (RSHRA) that the City of Phoenix and USACE constructed. No permanent acreage loss of WOUS or wetlands is anticipated. Impacts on WOUS would include the temporary discharge of fill into 0.16 acre of wetlands and 0.60 acre of open water. Portions of the Build Alternative are located within three separate 100-year floodplains. Because the Build Alternative is on an existing alignment and would be graded to preconstruction elevations after construction, the Build Alternative would not substantially modify the topography in the study area. Therefore, no impacts to floodplains are anticipated. With implementation of mitigation measures, the Build Alternative would have no adverse effect on wetlands.
Mitigation	- Valley Metro would prepare and submit an application to USACE for a Clean Water Act Section 404 permit for work in WOUS and wetlands. The Section 404 permit application would be submitted to USACE prior to construction. - To protect WOUS, the Contractor shall comply with all terms and conditions of the Section 404 permit as established by USACE, including the associated Section 401 conditions, certified by the Arizona Department of Environmental Quality. - Valley Metro would clearly identify the limits of the work area in wetlands and WOUS in the field (for example, by staking or flagging) prior to ground-disturbing activities. The Contractor would avoid all flagged and/or otherwise designated sensitive resource areas within or adjacent to the project area. - The Contractor would site temporary storage, staging, materials lay down and other work areas in uplands or previously disturbed areas to the extent possible.

Issue	Discussion
Mitigation (cont.)	- The Contractor would ensure that all equipment remains inside the identified project limits and that it would not be stored, maintained or repaired in areas mapped as wetlands or WOUS. - Valley Metro would develop a vegetation planting and habitat improvement plan using plant species used for the RSHRA to replace vegetation, including wetland vegetation, removed within the Salt River channel during final design and in consultation with the City of Phoenix. - The Contractor would restore water flow and circulation patterns of the Salt River following construction to allow the wetland to reestablish - The Contractor would develop and implement a Stormwater Control Plan that includes a Spill Prevention and Containment Measures Plan (staging areas, nonpoint source spills containment and clean up, concrete washout, etc.) for working within and adjacent to the Salt River channel and its wetlands. - The Build Alternative is within a designated 100-year floodplain. Therefore, Valley Metro would provide an opportunity for the City of Phoenix floodplain manager to review and comment on design plans.
Water Quality	
Impact	No aquifers or sole source aquifers exist in the study area. No existing groundwater wells would be affected by the Build Alternative. No impaired or non-attaining waters are in the vicinity of the Build Alternative. The light rail vehicles include provisions for containing possible pollutants such as oil and grease, but infiltration of these small losses into groundwater is possible. Although the Build Alternative is located primarily in the existing ROW, it would add a small amount of impervious surface area in the study area from the addition of stations, TPSSs, park-and-rides and other improvements outside the existing ROW. The increase would be negligible relative to the total impermeable area that results from surrounding development. Stormwater runoff would not substantially increase as a result of the Build Alternative. Work over waterbodies could introduce sediments and construction debris into canal or RSHRA waters. The Build Alternative would result in greater than 1 acre of ground disturbance. With implementation of the mitigation measures, the Build Alternative would have no adverse effect on water quality.
Mitigation	- The Contractor would be required to obtain an Arizona Pollutant Discharge Elimination System (AZPDES) permit prior to construction and to comply with the permit stipulations. The Contractor would file a Notice of Intent and Notice of Termination with the Arizona Department of Environmental Quality (ADEQ). - The Contractor would be required to comply with the City of Phoenix's Stormwater Pollution Control Ordinance, which prohibits most discharges (indirect and direct) into stormwater systems. - Prior to construction on the Central Ave or the Western Canal bridge, the Contractor would develop a containment system to prevent debris from entering the Salt River or the Western Canal during construction. - Valley Metro would prepare and submit an application to ADEQ for a Section 401 Water Quality Certification. - To protect water quality, the Contractor shall comply with all terms and conditions of the Section 401 permit. With implementation of the mitigation measures, the Build Alternative would have no adverse effect on water quality.

Issue	Discussion
<i>Ecologically Sensitive Areas and Threatened and Endangered Species</i>	
Impact	The Build Alternative would result in a “may affect, but is not likely to adversely affect” finding for the Southwestern willow flycatcher and the Yuma clapper rail through the temporary loss of habitat. The Build Alternative would result in “no effect” to the yellow-billed cuckoo. In addition, the Build Alternative would not result in a “take” under the Bald Eagle and Golden Eagle Protection Act. Twenty-four birds protected under the Migratory Bird Treaty Act may occur in the study area. Some displacement of these species and their nests could occur because of the temporary loss of habitat and increased activity in the area during construction.
Mitigation	• The Contractor would minimize construction activity disturbance to riparian vegetation by avoiding vegetation to the extent possible and trimming trees rather than removing them if practicable and without severely reducing the survivability of the tree. • Valley Metro would clearly define the limits of the work area in wetlands and the Salt River low-flow channel (for example, by staking or flagging) prior to ground-disturbing activities. The Build Alternative would avoid all flagged and/or otherwise designated sensitive resource areas within or adjacent to the study area. • The Contractor would not conduct any clearing, grubbing or tree/limb removal from March 1 to August 31 unless a wildlife biologist has conducted a bird nest search of the affected vegetation and has determined that no active bird nests are present. Vegetation removal may occur if the area has been surveyed within 5 days prior to removal as long as only inactive bird nests, if any, are present. During the nonbreeding season (September 1 to February 28), vegetation removal is not subject to this restriction. • The Contractor would stage and store materials and other work areas in uplands or previously disturbed areas to the extent possible. • The Contractor would keep equipment inside the identified Build Alternative limits; equipment would not be stored, maintained or repaired within the RSHRA. • Valley Metro would develop a vegetation planting and habitat improvement plan using plant species used for the RSHRA to replace vegetation removed within the Salt River channel. • The Contractor would develop and implement a Stormwater Control Plan that includes a Spill Prevention and Containment Measures Plan (staging areas, nonpoint source spills containment and clean up, concrete washout, etc.) for working within and adjacent to the Salt River channel. • Valley Metro would arrange for a wildlife biologist to perform a preconstruction survey within the RSHRA or Operations and Maintenance Center expansion area if construction occurs during the breeding season for migratory birds. • The Contractor would restore the Salt River channel, water flow and circulation patterns to preconstruction conditions following construction.
<i>Construction</i>	
Impact	The project would result in short-term disruption impacts on local businesses and residents surrounding construction. Short-term impacts are 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 would be implemented. As with any construction project, the adverse impacts would end upon construction completion.

Issue	Discussion
Mitigation	- Valley Metro, its Contractor(s) and the City of Phoenix would work together to create 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. - Valley Metro would implement programs similar to those developed for the Central Mesa Extension project 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 Phoenix. The Contractor would be required to follow standard Valley Metro specifications to minimize adverse impacts on the surrounding community. - The City of Phoenix 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 construction activities. - The Contractor would develop a traffic control plan compliant with the City of Phoenix, Valley Metro and Maricopa Association of Governments specifications. - The Contractor would adhere to Valley Metro and City of Phoenix standard requirements for utilities. - The Contractor would transport debris and soil generated by construction to approved disposal sites and would obtain the necessary state and local permits. - Valley Metro would coordinate with the appropriate Contractor, City agency and the public during the project development phases to develop an access management plan. - Valley Metro would implement measures to maintain light rail service and connectivity to transit services. - The Contractor would comply with the City of Phoenix noise control ordinance. - 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. - The Contractor shall comply with the AZPDES permit and the City of Phoenix's Stormwater Management Plan and implement appropriate best management practices. - Valley Metro would conduct a preconstruction inspection to determine the existing conditions of the first row of buildings along the light rail transit route and any important and potentially fragile historic resources that may be within 200 feet of the streets that the light rail transit vehicles would traverse.
Cumulative Impacts	
Impact	The Build Alternative is expected to contribute beneficially to the cumulative impact of reasonably foreseeable projects in the study area. Project-specific mitigation measures as proposed in this environmental assessment (EA) that address direct impacts inherently address reductions in such overall impacts as well. Mitigation measures presented throughout this EA, when implemented, would help offset any cumulative impacts of the Build Alternative; therefore, the Build Alternative is not expected to individually or cumulatively have a significant environmental effect.

Issue	Discussion
Mitigation	- Should several projects be constructed concurrently with the Build Alternative, Valley Metro would coordinate closely with the City of Phoenix, Arizona Department of Transportation or other project sponsors to coordinate construction efforts and appropriate short-term mitigation measures, such as enhanced signs for business and traffic control during construction to minimize significant disruptions. - The construction Contractor would be required to obtain an AZPDES permit prior to construction and to comply with the stipulations of the permit. The AZPDES requires that a Stormwater Pollution Prevention Plan be developed that includes best management practices and a Notice of Intent and Notice of Termination filed with ADEQ. - The construction Contractor would be required to comply with the City of Phoenix Stormwater Management Plan. - The Contractor would comply with all local air quality and dust control rules, regulations and ordinances that apply to any work performed pursuant to the contract.
<i>Farmlands and Coastal Zones</i>	
Impact	No farmlands or coastal zones are located within or adjacent to the Build Alternative.
Mitigation	Not applicable

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

The estimated capital cost for the 5-mile Build Alternative is \$623 million in year-of-expenditure dollars. The estimated annual operating cost for the Build Alternative is \$6 million in opening year dollars. For additional information, refer to Chapter 5.0 of this EA, which provides an overview of the anticipated capital and operating costs for the 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 New Starts discretionary grant funding for the Build Alternative, but these funds have not yet been programmed.

Capital Costs Funding Sources

Table ES-3 presents a breakdown of estimated capital costs and funding sources. Approximately 50.5 percent (\$314.6 million) of the funds for capital costs are programmed to come from the Proposition 104 Local Transportation Tax approved by City of Phoenix voters in August 2015. The remaining 49.5 percent (\$308.4 million) of the funding would be derived from the New Starts discretionary grant program. No funds from the State of Arizona would be used for this Build Alternative.

TABLE ES-3: ESTIMATED CAPITAL COSTS AND FUNDING SOURCES

Source	Amount (Million \$)	% of Total Capital Costs
<i>Federal</i>		
New Starts	308.4	49.5
<i>Local</i>		
Proposition 104	314.6	50.5
Total	623.0	100

Operating Costs Funding Sources

Approximately 75 percent of the funds (\$4.5 million) that would be used for operations would be supported by a dedicated City of Phoenix transportation tax. The remaining 25 percent (\$1.5 million) 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 that the current farebox recovery rate for the existing light rail system is 40 percent (fiscal year 2014).

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

Source	Amount (Million \$)	% of Total Operating Costs
Proposition 104	4.5	75
Farebox recovery	1.5	25
Total	6.0	100

The fares for the Build Alternative would be the current fare structure that has been established for the light rail system and for the regional bus service (\$2 per ride or \$4 for rides all day).¹ Fares would not be increased from the current fare structure for the Build Alternative. Fares are regularly monitored and may be adjusted periodically to maintain the minimum 25 percent fare recovery rate for local services.

¹The full Valley Metro fare structure can be found at http://www.valleymetro.org/paying_your_fare.

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 Phoenix and the Federal Transit Administration (FTA), proposes to construct the South Central Light Rail Extension and expand the existing Operations and Maintenance Center (OMC) in Phoenix, Arizona. This environmental assessment (EA) presents the results of an analysis of the environmental effects of the proposed action, or Build Alternative, in accordance with requirements of the National Environmental Policy Act (NEPA) of 1969. This EA also discusses a No-Build Alternative, pursuant to NEPA requirements, to compare the environmental effects that could occur without implementation of the Build Alternative. Because the proposed Build Alternative would be partially funded through one or more federal sources, it must be evaluated in accordance with Council on Environmental Quality regulations (40 Code of Federal Regulations [CFR] Parts 1500–1508) and FTA regulations for implementing NEPA (23 CFR 771). Chapter 5.0 provides additional information about potential funding sources.

In 2013, the Phoenix City Council adopted a Build Alternative for a 5-mile light rail transit (LRT) extension on Central Avenue from Jefferson Street in Downtown Phoenix to Baseline Road. The Build Alternative would extend light rail service south from Downtown using a one-way couplet, with southbound operations on 1st Avenue and northbound operations on Central Avenue, before converging at Hadley Street and resuming two-way median operations on Central Avenue to its terminus at Baseline Road. The Build Alternative would also include track improvements at McKinley Street and expansion of the OMC's trackwork, Maintenance of Equipment (MOE) building and cleaning platform to support the additional fleet needed for operations. Chapter 2.0 provides additional information on the Build Alternative evaluated in this EA.

The Build Alternative is a project in the fiscally constrained adopted *Regional Transportation Plan* (RTP). Although the South Central Light Rail Extension was not originally a part of the 2004 voter-approved RTP's concept to build 57 miles of high-capacity transit (HCT) improvements in the Maricopa Association of Governments (MAG) region, it was formally approved by the MAG Regional Council as a major amendment to the RTP in June 2015. The RTP major amendment process required the review and recommendation of the Build Alternative by the State Transportation Board, the Board of Directors of the Regional Public Transportation Authority and the Maricopa County Board of Supervisors. Figure 1-1 displays the proposed Build Alternative's route in relation to the existing Valley Metro 23-mile light rail line and other planned HCT corridor improvements. The Build Alternative is proposed to serve the study area illustrated in Figure 1-2, which is generally bounded by Roosevelt Street to the north, South Mountain Avenue to the south, 7th Avenue to the west and 7th Street to the east. Figure 1-3 depicts the OMC expansion study area, which is bounded by the Union Pacific Railroad (UPRR) tracks to the north, Loop 202 to the south, State Route (SR) 143 to the west and Priest Drive to the east. Valley Metro plans to begin operations in the South Central Avenue corridor in 2023.

FIGURE 1-1: VALLEY METRO HIGH-CAPACITY TRANSIT CORRIDORS

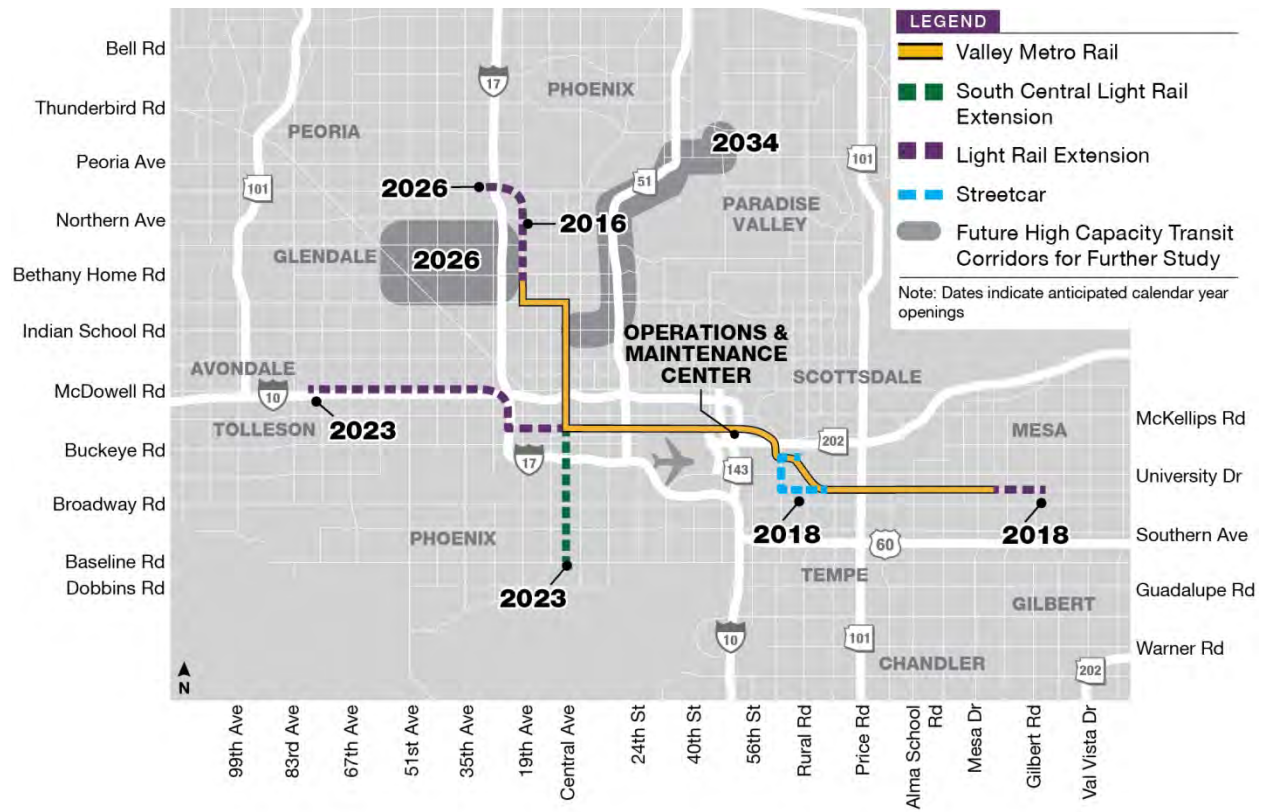


FIGURE 1-2: SOUTH CENTRAL LIGHT RAIL EXTENSION STUDY AREA

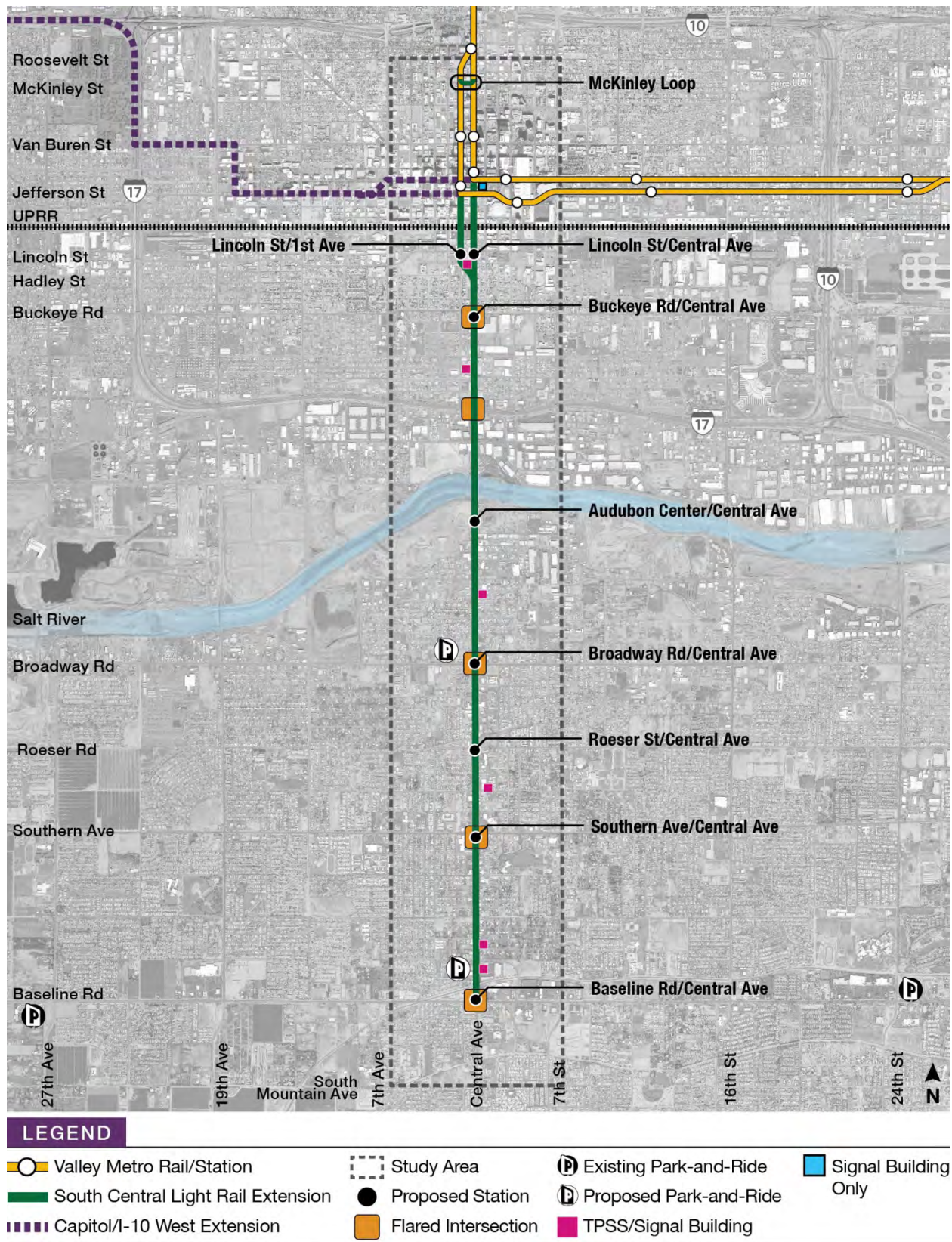
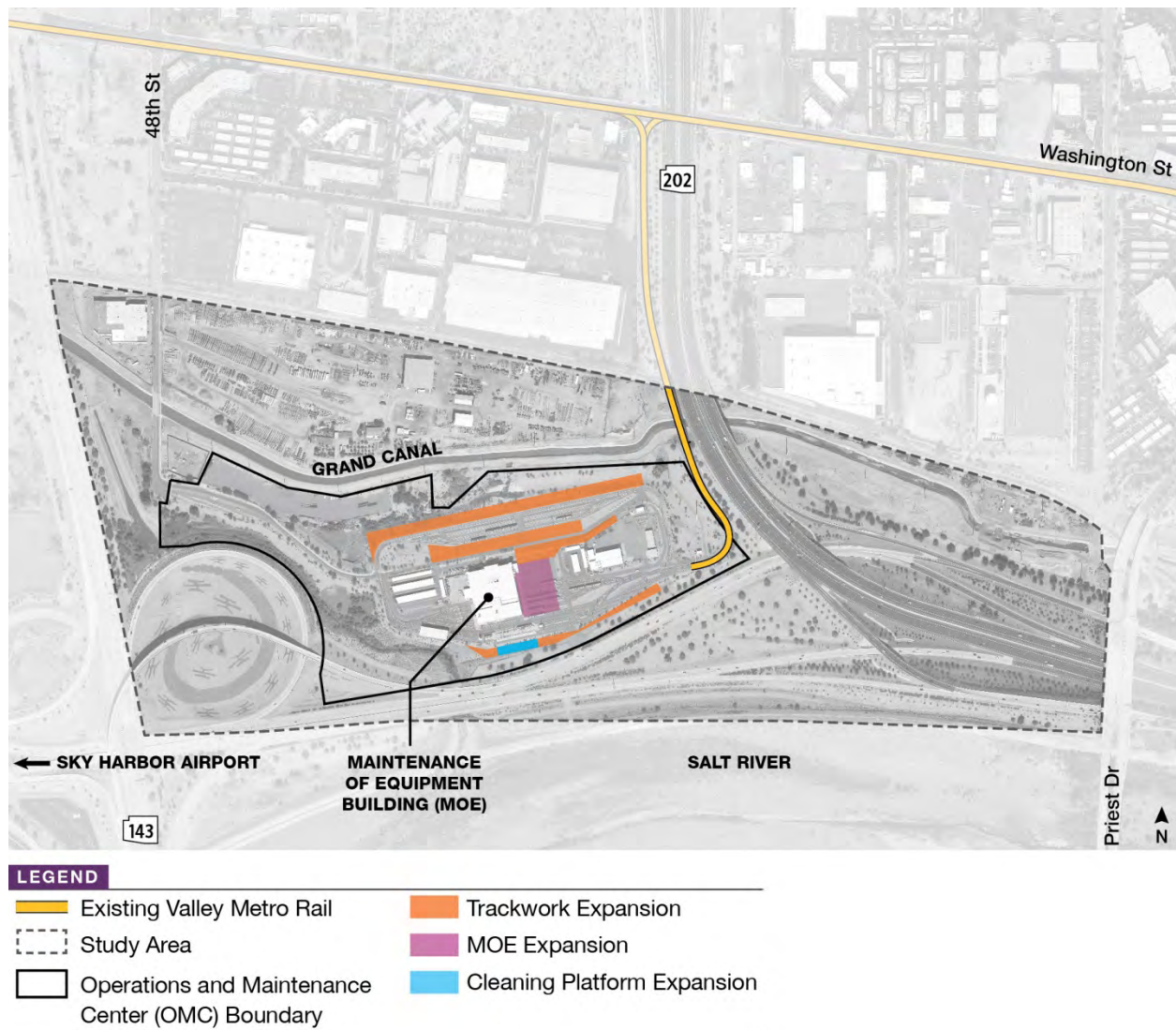


FIGURE 1-3: OPERATIONS AND MAINTENANCE CENTER EXPANSION AREA



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

The need for the Build Alternative is based on several existing and future transportation deficiencies identified during previous studies of South Central Phoenix. The addition of light rail service in the corridor would greatly improve the mobility of study area residents by providing a more efficient and reliable transit option that conveniently connects with both local and regional destinations. The need for the Build Alternative is demonstrated in the following five areas:

- Improving the reliability of transit service in the South Central Avenue corridor
- Improving mobility for low-income, minority and transit-dependent populations
- Addressing existing and future transit capacity issues

- Supporting current and planned economic and transit-oriented development in the Build Alternative corridor as identified in the City's 2015 General Plan
- Enhancing access from the South Mountain Village core and the Ed Pastor Transit Center to regional employment centers and activity destinations

1.2.1 Improving the Reliability of Transit Service in the South Central Avenue Corridor

Passenger count data from April 2015 indicate that the three north-to-south routes in the study area (Route 0 – Central Avenue, Route 7 – 7th Street and Route 8 – 7th Avenue [Figure 2-19 in Chapter 2.0 shows these routes]) produce more than 1,000 daily passenger trips per corridor mile. Furthermore, ride check data from the Phoenix Public Transit Department indicate that more than half of the sampled bus trips on Routes 0, 7 and 8 in the study area experience delays of 2 minutes or more during peak periods. While some buses may make up the scheduled time at some location along the route, any intermediate delay can result in missed transfers, especially to routes with less frequent service. The primary factors contributing to delays on these routes are the mixed traffic operations of local bus service, which makes it susceptible to traffic congestion, and the high volume of passenger boardings at several stop locations, particularly during peak periods. Light rail service in the corridor would substantially increase both reliability and travel speed compared with existing local bus service. By operating in a semiexclusive guideway with transit signal priority, light rail service would not be affected by traffic congestion in the corridor. Furthermore, the greater distance between stations would result in less frequent stops and higher average operating speeds resulting in a reduction in travel time as compared with local bus service.

For corridors such as Central Avenue where demand is high, light rail service can result in greater reliability, faster travel times and lower operating costs through economies of scale. The Build Alternative represents a long-term solution and transit investment that can function as a “spine” for the surrounding transit network by supplying the reliability and speed to attract and retain riders. This type of service not only increases the value of transit service in the corridor, but of all routes with which it interacts, thereby facilitating the system's continued growth.

1.2.2 Improving Mobility for Low-income, Minority and Transit-dependent Populations

Recent demographic data indicate the study area population is highly transit-dependent. As summarized in Table 1-1, the percentage of the study area population living at or below the poverty level is twice that of Maricopa County. Similarly, the percentage of the study area population that is minority is two times higher than that of the County, and the percentage of zero-auto households is three times higher. Furthermore, the percentage of study area residents commuting to work using alternative modes is much higher than that of Maricopa County. As summarized in Table 1-2, the percentage of study area residents commuting to work is four times higher for transit, five times higher for walking and twice as high for bicycling than that of Maricopa County.

TABLE 1-1: STUDY AREA DEMOGRAPHIC COMPARISON, 2013

Area	Population	Percentage below Poverty ^a	Percentage Minority	Percentage Zero Auto Households
Study area	25,584	41	83	14
Phoenix	1,473,639	23	53	5
Maricopa County	3,889,161	17	42	3

Source: American Community Survey (2013)

^a Population at or below 100 percent of the poverty level as defined by the U.S. Department of Health and Human Services

TABLE 1-2: STUDY AREA COMMUTE TO WORK MODE COMPARISON, 2013

Area	Workers 16 and Over	Percentage Using Transit	Percentage Walking	Percentage Bicycling	Total Percentage
Study Area	7,414	8.5	8.8	1.7	19
Phoenix	644,155	3.4	1.9	0.7	6
Maricopa County	1,705,638	2.4	1.6	0.8	4.8

Source: American Community Survey (2013)

The level of transit dependency is further evidenced by the following statistics from Valley Metro's *2010-11 On-Board Survey* associated with the three north-to-south bus routes (Routes 0, 7 and 8) in the study area:

- 93 percent of customers walk or ride bicycles to access the bus (versus 91 percent regionally for "bus-only" linked transit trips).
- 56 percent come from households with no auto (versus 48 percent regionally).
- 69 percent are not licensed to drive (versus 56 percent regionally).

1.2.3 Addressing Existing and Future Transit Capacity Issues

Despite frequent service in the corridor (every 10 minutes), local buses on Route 0 still exceed capacity during peak travel hours. According to the City of Phoenix Public Transit Department, trips during peak hours regularly experience overcrowding and have reached load rates as high as 160 percent on a fleet of 35-seat buses. The Ed Pastor Transit Center is the site of particularly high activity, with over 500 average daily boardings occurring among the multiple routes that serve the facility. Additionally, over half of all Route 0 boardings occur within the study area despite accounting for less than 40 percent of the total route length. Furthermore, the projected growth in population, employment and travel demand in the study area will only exacerbate the problem. MAG traffic analysis zone data indicate population and employment in the study area are projected to grow by 70 percent and 42 percent, respectively, by 2035. Additionally, according to MAG's 2010 regional travel demand model, a 26 percent increase (from 2010) in daily person trips (by all modes) will occur between South Central Phoenix and destinations along North Central Avenue by 2031. By the same year, a 19 percent increase in trips is expected between South Central Phoenix and the Phoenix Sky

Harbor International Airport/Tempe area. The Build Alternative is needed to provide additional capacity to satisfy both existing and future demand in the study area.

1.2.4 Supporting Current and Planned Economic and Transit-oriented Development in the Build Alternative Corridor as Identified in the City's 2015 General Plan

Although the South Central Avenue corridor has historically been economically deprived, significant economic development opportunities exist in the study area. Its proximity to Downtown Phoenix, Phoenix Sky Harbor International Airport and the regional surface transportation system makes it an ideal location for investment in light rail service, which can facilitate economic and transit-oriented development. Vacant and underdeveloped sites along the corridor provide ample opportunity for new development in the half-mile study area surrounding the Build Alternative that conforms to Phoenix's vision of sustainable, transit-supportive urban development, as described in the City's 2015 General Plan (City of Phoenix 2015a). A recent analysis of Maricopa County parcel data revealed that over 600 vacant parcels exist in the study area, totaling over 11 million square feet (sq ft., approximately 253 acres) of developable land. Efficient and effective transit service in the study area would contribute to the area's desirability as a place to live and work and would support other public and private investments.

Over the last several years, the City of Phoenix has made transit-oriented and infill development a priority along its key transit corridors, including the South Central Avenue corridor. To encourage such development, the City has created both a Transit Oriented Development Overlay District and an Infill Development Overlay District. The overlay districts, which encompass large portions of the study area, have additional development requirements to encourage the dense, mixed-use development that would support HCT service.

Development along the existing light rail corridor is a good indicator of how future development could proceed in the Build Alternative corridor. Since opening in December 2008, over \$8.2 billion of development has occurred within a half mile of the light rail corridor, with the 13-mile Phoenix portion of the line accounting for over half of such development (\$4.6 billion). This development has added over 10 million sq ft. of commercial/office space and nearly 16 million sq ft. of residential space in Phoenix. Implementation of the Build Alternative could facilitate the same type of sustainable, transit-oriented development in the South Central Avenue corridor.

1.2.5 Enhancing Access from the South Mountain Village Core and the Ed Pastor Transit Center to Regional Employment Centers and Activity Destinations

By creating a seamless connection with the existing light rail line and planned future transit corridors, the Build Alternative would enhance access to major regional employment centers, academic institutions and entertainment and commercial destinations. Primary among these employment and activity centers is Downtown Phoenix, which the Build Alternative would directly serve. Long considered the region's primary employment center and home to the region's financial and governmental institutions, Downtown Phoenix has transformed over the last 15 years into a diverse and vibrant 24-hour destination. Major developments that have contributed to this

transformation include the Arizona State University (ASU) Downtown Campus, the Phoenix Biomedical Campus, the Cityscape high-rise mixed-use development and the Phoenix Convention Center expansion. Other destinations within the corridor include St. Vincent de Paul, Nina Mason Pulliam Rio Salado Audubon Center, Travis L. Williams Family Services Center and Jesse Owens Memorial Medical Center.

In addition to serving the dense Downtown Phoenix employment center, the Build Alternative would also serve the South Mountain Village core, an area the City of Phoenix and the South Mountain Village have identified as the hub of South Central Phoenix and the desired location for increased density and commercial activity. The Ed Pastor Transit Center is an important site within the South Mountain core because it is served by three key local routes and two local routes. Providing a connection to light rail service at this facility would enhance the ability of both rail and bus passengers to access destinations and employment centers in the study area and throughout the region. Similarly, the enhanced bus service that would be implemented as a part of the Build Alternative would increase frequencies on Baseline Road between the existing park-and-ride facilities at 27th Avenue and 24th Street, thereby providing a higher level of service to destinations and employment centers outside of the study area and feeding passengers into the Build Alternative end of line.

While the Build Alternative corridor would enhance access to the activity centers mentioned above, it also represents an opportunity for continued development, given the 9.8 percent of vacant land within one-half mile of the Build Alternative.

The Build Alternative would also help connect study area residents with several of the region's other top employment centers situated along the existing light rail line including North Central Avenue, Phoenix Sky Harbor International Airport and Downtown Tempe/ASU. Together with Downtown Phoenix, these employment centers account for over 11 percent of total regional employment.

1.3 WHAT IS THE PURPOSE OF THE PROPOSED BUILD ALTERNATIVE?

The purpose of the Build Alternative is to improve the mobility of the highly transit-dependent population in the study area and to provide additional capacity in the South Central Avenue corridor. The Build Alternative is intended to provide study area residents with convenient and reliable transit service with sufficient capacity to meet existing and projected population and employment growth in the corridor.

Additionally, the purpose of the Build Alternative is to satisfy existing and projected travel demand between the study area and major regional activity centers including Downtown Phoenix, the North Central Avenue employment center, Phoenix Sky Harbor International Airport and the ASU Main and Downtown Campuses.

Finally, the Build Alternative is intended to support existing and planned economic and transit-oriented development opportunities by improving access to existing and planned regional activity centers throughout the South Central Avenue corridor.

1.4 WHAT ARE THE GOALS FOR THE PROPOSED BUILD ALTERNATIVE?

In addition to the purpose and need, the four goals and associated objectives provided below were formulated based on public and stakeholder input to guide development of the Build Alternative (see Chapter 4.0 for additional information about community input).

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

- Enhance connectivity to existing and planned regional activity centers and attractions near Downtown Phoenix, North Central Avenue, Phoenix Sky Harbor International Airport and Downtown Tempe.
- As specified in the South Central Neighborhood Transit Health Impact Assessment (Maricopa County Public Health 2015), improve accessibility to employment, health care, social services, healthy food, recreation and other amenities for transit-dependent populations, thereby improving quality of life and social cohesion.

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

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

Goal 3 – Improve upon the existing transit system by enhancing consistency with local, state and federal initiatives that support local and regional land use and development goals.

- Ensure consistency with local and regional plans including the RTP (MAG 2014a) and the Sustainable Transportation and Land Use Integration Study, along with the City of Phoenix 2050 Citywide Transportation Plan, 2015 General Plan and Transit Oriented Development and Infill Development Overlay Districts.
- 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 – Demonstrate compatibility with community sustainability and livability goals.

- Provide bicycle and pedestrian facilities to promote these modes as not only viable but desirable transportation alternatives.
- Support economic vitality in the Build Alternative corridor.

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2.0 ALTERNATIVES TO THE PROPOSED PROJECT

This chapter describes the alternatives evaluated in detail in this EA. Section 2.1 describes the alternatives that were considered throughout the Alternatives Analysis (AA) process. Subsequent sections describe the alternatives that are evaluated in detail in this EA: the No-Build and Build Alternatives. The preferred alternative, or Build Alternative, was approved by the Phoenix City Council in December 2013 and by the Valley Metro Board of Directors in September 2014 and is carried forward for environmental analysis in this EA.

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

The Build Alternative was identified through a multistep AA process conducted by Valley Metro and the City of Phoenix from 2011 through 2014. The planning process was a collaborative effort involving technical evaluation led by Valley Metro and the City of Phoenix, with public input and stakeholder interaction (including open houses and workshops), meetings with individual community and business associations and stakeholders and written and website correspondence. Additional information about public outreach activities during the AA process can be found in Sections 4.3.1 and 4.3.2 of Chapter 4.0 of this EA. In addition, the Valley Metro team met biweekly with City of Phoenix staff throughout development of the Build Alternative. City representatives were involved in decision making as equal partners with Valley Metro. Participating departments varied, but typically included the City Manager's Office, Community and Economic Development, Planning and Development, Neighborhood Service, Public Transit, Street Transportation, Real Estate and the Village Planners for the Central City and South Mountain Villages.

The major steps in the AA process were: Tier 1 screening, Tier 2 screening and refinement of the leading alternative emerging from the Tier 2 screening. The number of alignment alternatives and transit modes under consideration was reduced as the technical analysis became increasingly detailed as the study advanced through each step of the screening process. Further information about the AA process can be found in the *Alternatives Analysis: South Central Corridor Locally Preferred Alternative Report* (2014).¹

2.1.1 Tier 1 Screening

The Tier 1 screening considered a vast array of alternatives, specifically concentrating on identifying “fatal flaws” for the transit mode and alignment. Three modes were considered: light rail, bus rapid transit (BRT) and modern streetcar. Primary differences between these modes are shown in Figure 2-1. Eleven alternative alignments were considered, as portrayed by the green lines on Figure 2-2. The alternative alignments considered featured portions of 7th Avenue, 1st Avenue, Central Avenue and 7th Street to travel south from Downtown Phoenix, eventually rejoining Central Avenue at Hadley

¹ The report is available at http://www.valleymetro.org/projects_and_planning/project_detail/south_central.

Street, Lincoln Street, Buckeye Road, Mohave Street or Broadway Road. All alternatives considered featured two-way service from Broadway to Baseline Roads.

The Valley Metro team, along with City of Phoenix staff, recognized early on that no alternative could succeed without serving the South Mountain Village core, focused along Central Avenue between Broadway and Baseline Roads, with its hub near the intersection of Central Avenue and Broadway Road—the location of the Ed Pastor Transit Center. Therefore, every alignment alternative used Central Avenue from Broadway Road south to Baseline Road. Each of the three technologies was considered for each of the 11 alignments developed, resulting in 33 combinations of potential alignment and technology alternatives.

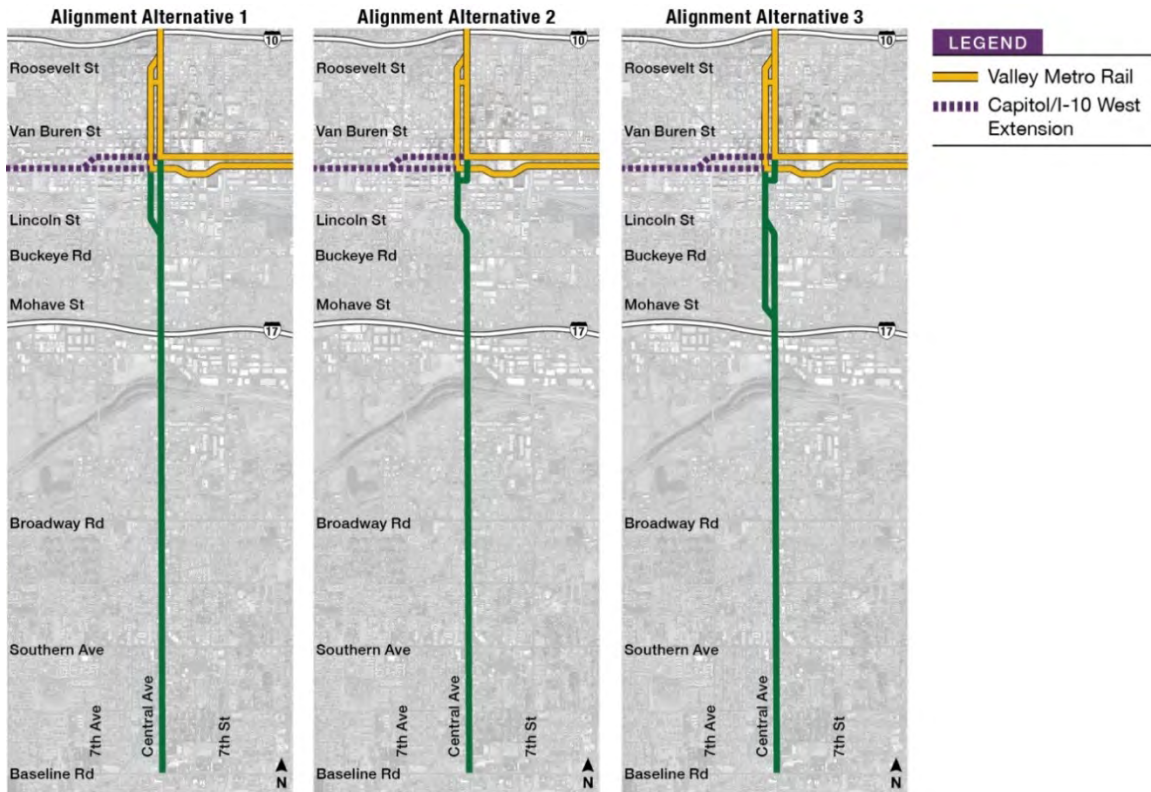
FIGURE 2-1: MODAL ALTERNATIVES CONSIDERED

	Light Rail Transit	Modern Streetcar	Bus Rapid Transit
Purpose / Market Type	Higher-speed, high-demand regional connections	Moderate-speed, moderate-demand local or regional connections	Higher-speed, high-demand local or regional connections
Operating Environment	Dedicated or semi-dedicated guideway	Semi-dedicated guideway or arterial streets in mixed traffic	Semi-dedicated guideway or arterial streets in mixed traffic
Spacing of Stops	Approximately every one-half to one mile or longer	Approximately every one-fourth to one-half mile	Approximately every one-half to one mile or longer
Passenger Capacity per Vehicle	Approximately 180-200 per car	Approximately 130-160 per car	Approximately 60-90 per bus
Flexible Routing	No	No	Yes
High Economic Development Potential	Yes	Yes	No
			

The Tier 1 screening consisted of two separate, nonquantitative analyses: screenings of the 3 modal alternatives and the 11 alignment alternatives. Valley Metro selected the following criteria to screen both the modal and alignment alternatives:

- Potential for new ridership
- Physical and engineering constraints
- Transit-oriented land use and economic development potential
- Transportation network integrity and functionality
- Costs (capital and operating)

FIGURE 2-2: TIER 1 ALIGNMENTS
ALIGNMENTS 1 THROUGH 3: CENTRAL AND 1ST AVES



ALIGNMENTS 4 THROUGH 6: 7TH AVE NORTH OF SALT RIVER

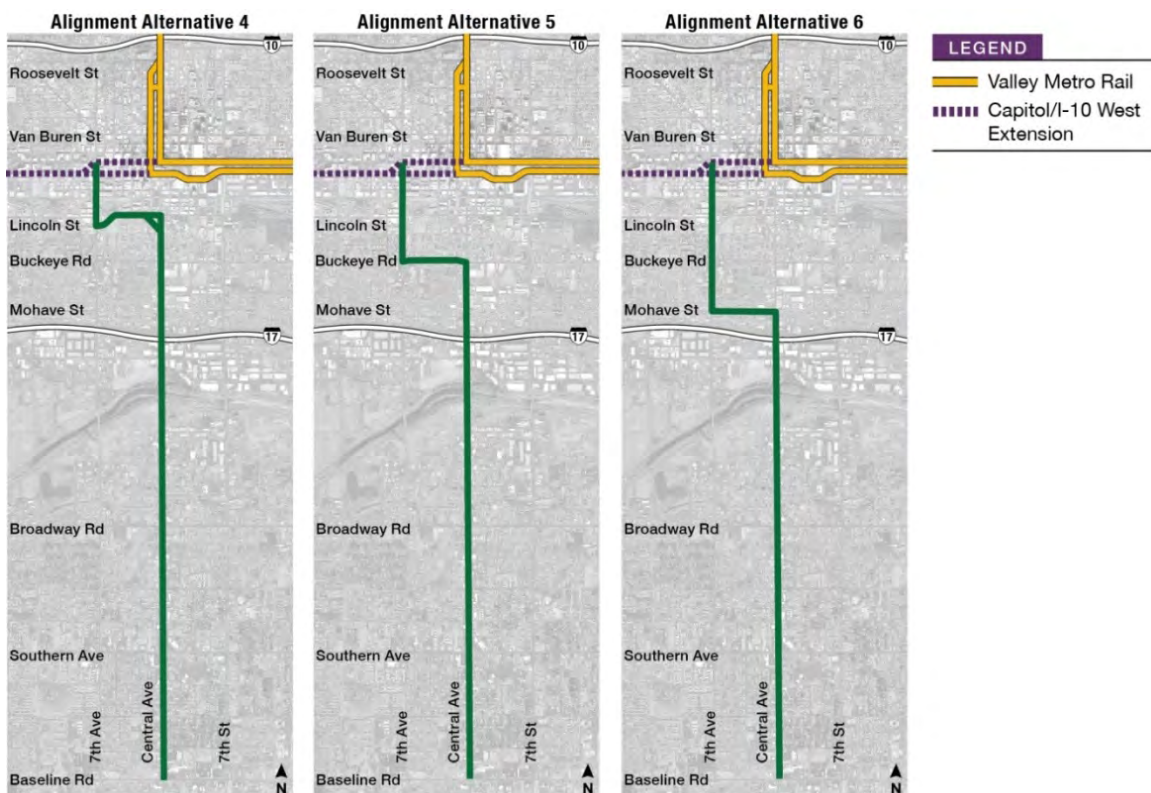
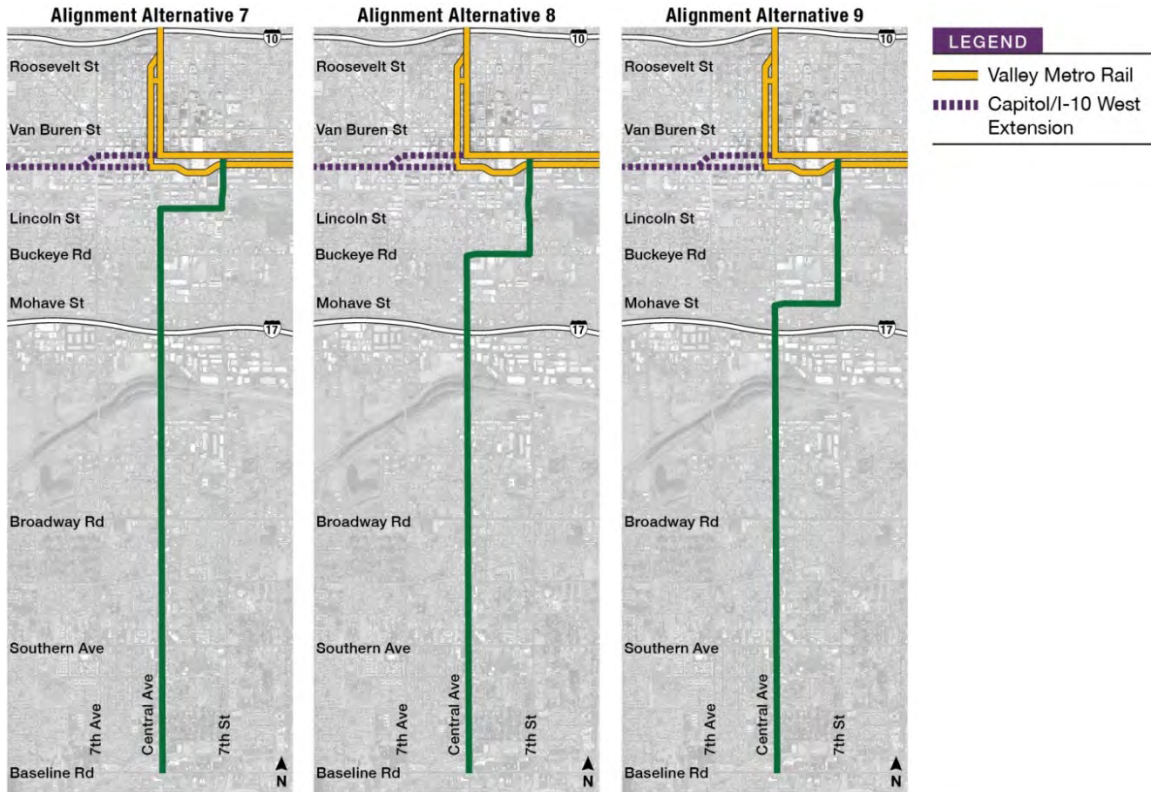
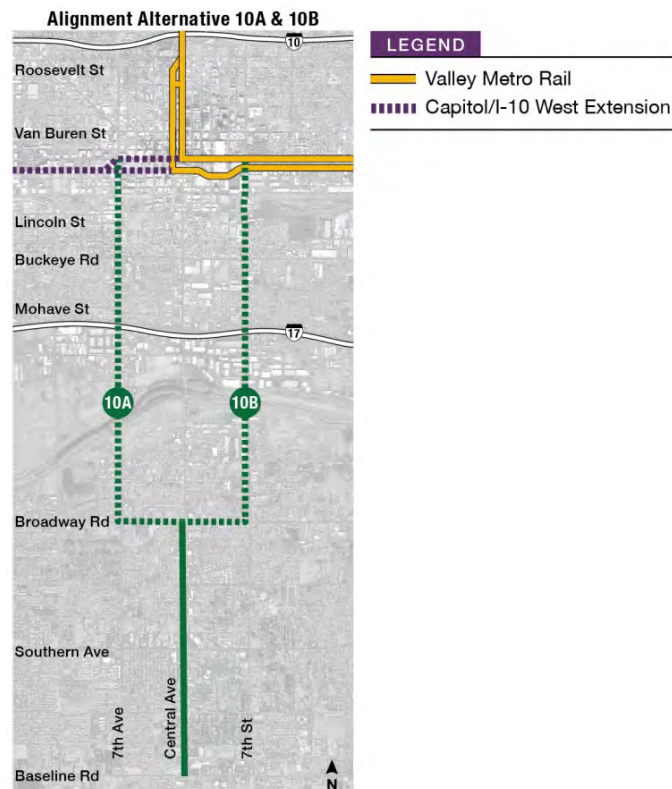


FIGURE 2-2: TIER 1 ALIGNMENTS (CONTINUED)

ALIGNMENTS 7 THROUGH 9 – 7TH STREET NORTH OF SALT RIVER



ALIGNMENTS 10A AND 10B – 7TH ST OR 7TH AVE NORTH OF BROADWAY RD



As a result of the screening, the following alternatives were selected for further, more detailed evaluation in the Tier 2 analysis. Table 2-1 summarizes the rationale for recommending advancement for further consideration.

- **Alignments 1 and 2** (Central and 1st Avenues) using any of the three modes (light rail, BRT and modern streetcar) for Alignment 1 and using light rail or modern streetcar for Alignment 2. These were the most highly rated of any of the alternatives. BRT was dismissed as a technology for Alignment 2 because it required a contraflow operation and detour for northbound traffic on 1st Avenue, and Alignment 1 using BRT was determined feasible because it did not require the contraflow operation. In addition, BRT using Alignment 1 could successfully travel through the Central Avenue underpass which was a potential issue for the two rail modes. Therefore, it was unnecessary to further evaluate BRT using Alignment 2.
- **Alignment 5** (7th Avenue from Buckeye Road north to the light rail line Downtown connection) using all three modes considered.

In addition to Alignment 2 using BRT as previously discussed, the following alternatives were eliminated from further consideration using any of the three modes: Alignments 3, 4, 6, 7, 8, 9, 10A and 10B. The reasons for their elimination varied but mainly focused on the following issues:

- Some of the alignments (3, 4, and 6) traversed portions of neighborhood streets where high capacity transit was poorly suited and/or residents objected to transit coming down their streets.
- All 7th Avenue and 7th Street alignments, with the exception of Alignment 5, would have resulted in additional travel time through the corridor with no corresponding benefits such as serving high transit demand neighborhoods, employers, or services. Both rail technologies on these two alignments also required construction of a UPRR overpass which would have substantially added to the capital costs and, with the exception of Alignment 5, none would have had off-setting benefits such as higher ridership.
- All 7th Street alignments serve fewer trip ends than the other alignments and have no station at the 7th Street connection with existing light rail.
- The 7th Street and 7th Avenue alignments north of Broadway Road all shared the following drawbacks: Salt River crossing is more difficult than at Central Avenue; substantial additional capital costs are required for UPRR overpass construction for the rail alternatives; the alignments miss the Rio Salado development potential near Audubon Center; traffic impacts are greatest on mile-grid arterials; and the alignments have no ridership advantages compared to alignments carried forward.

TABLE 2-1: TIER 1 ALTERNATIVES CARRIED FORWARD FOR STUDY IN TIER 2

Mode	Dedicated Guideway or Mixed Traffic Operation?	Rationale for Carrying Alternative Forward for Further Study
<i>Alignment 1 – Central Ave and 1st Ave</i>		
Light rail	Dedicated	- Alignment avoids use of a contraflow (against flow of traffic) operation because it uses the existing one-way couplet on Central Ave and 1st Ave between the light rail connection Downtown and Hadley St. - Alignment avoids a northbound rail detour by remaining on Central Ave (instead of diverting to 1st Ave and then back to Central Ave) between Hadley St and Downtown. Feasibility of rail operating through the Central Ave underpass of Union Pacific Railroad and Jackson St requires further investigation. - Rationale is the same for both light rail and streetcar.
Modern streetcar	Mixed	
Bus rapid transit	Dedicated Or mixed	- Avoids contraflow operation and northbound detour for the same reasons stated for light rail and streetcar. - Bus rapid transit operations may prove more feasible than light rail or streetcar through the Central Ave underpass, but further investigation of modes is required.
<i>Alignment 2 – Central Ave and 1st Ave</i>		
Light rail	Dedicated	- Although this alignment requires a contraflow operation because operations in both directions would occur on the one-way southbound 1st Ave between Hadley St and the connection to light rail Downtown, it avoids potential issues with light rail operations through Central Ave underpass. - Alignment uses major streets to serve most direct route connecting Downtown with South Central Ave destinations.
Modern streetcar	Mixed	- Same as light rail above regarding avoidance of Central Ave underpass, contraflow operation and use of major streets to serve most direct route through the corridor. - Streetcar may have lower cost and greater community penetration because of closer stop locations than typical of light rail station spacing.
<i>Alignment 5 – 7th Ave from Buckeye Rd to Light Rail Connection Downtown</i>		
Light rail	Dedicated	- Alignment has the highest ratings for the Tier 1 evaluation criteria considered of any of the alternatives using either 7th St or 7th Ave. - Although this alignment requires reconstruction of the railroad overpass on 7th Ave similar to Alignment 4, which was eliminated, Alignment 5 serves additional housing, employment and services along 7th Ave.
Modern streetcar	Mixed	- Buckeye Rd is a minor arterial street that is more suitable for accommodating high-capacity transit operations for its return from 7th Ave/7th St to Central Ave than other streets considered (Grant St/Lincoln St and Mohave St). - Rationale is the same for both light rail and streetcar.
Bus rapid transit	Dedicated or mixed	- Similar to light rail and streetcar, bus rapid transit serves additional housing, employment and services along 7th Ave and uses Buckeye Rd arterial, the most logical east-to-west street for return to Central Ave. - BRT would not require construction of railroad overpass on 7th Ave.

Source: Valley Metro (2014a)

2.1.2 Tier 2 Screening

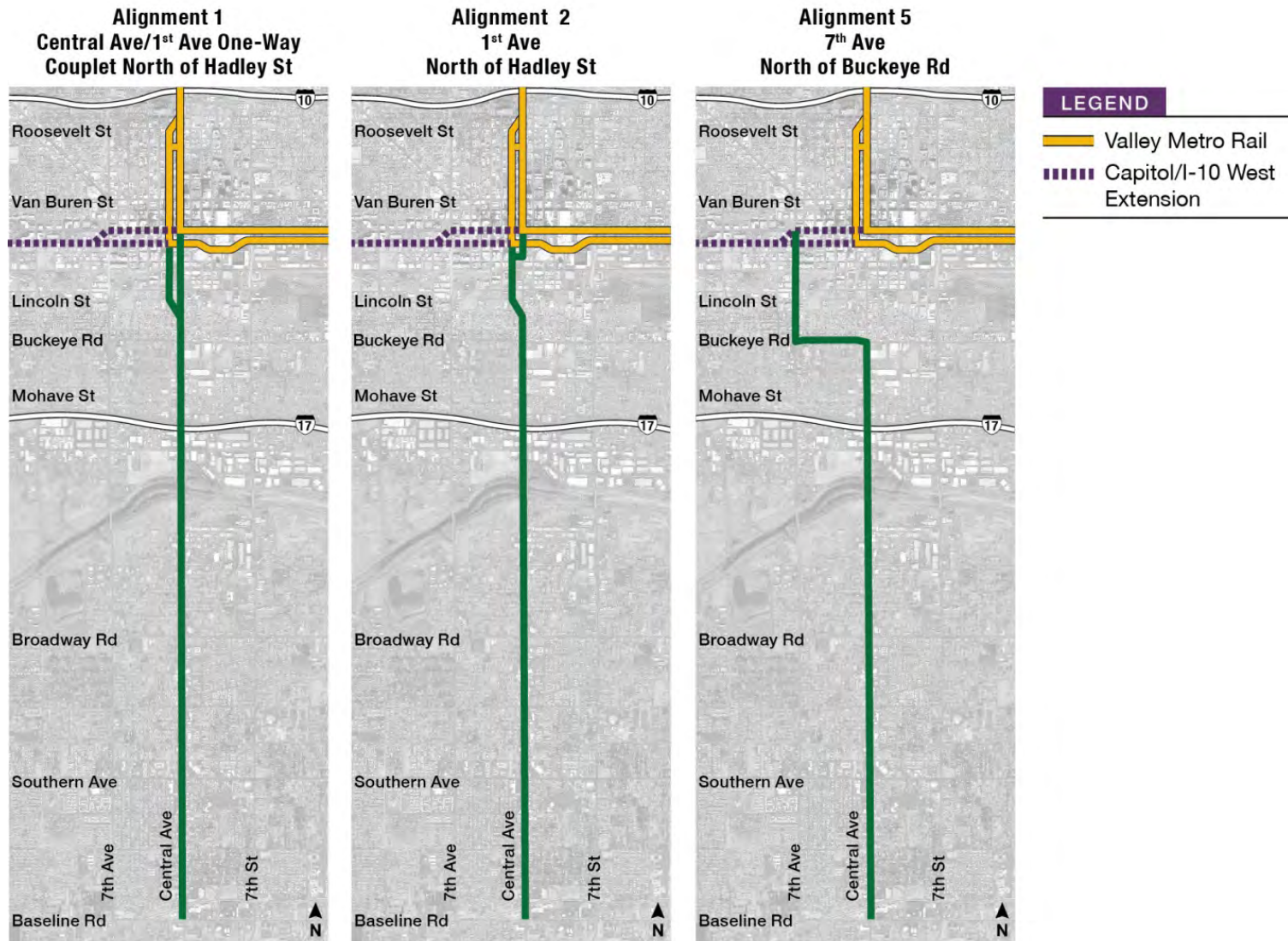
As a result of the Tier 1 screening, the three alignments presented in Figure 2-3 and identified in Table 2-1 were carried forward for more detailed analysis during the Tier 2 screening process. The Tier 1 recommendations called for further study of all three modes (light rail, modern streetcar and BRT) for Alignments 1 and 5 and further study of only light rail and modern streetcar for Alignment 2.

Despite the Tier 1 recommendation to carry forward both rail modes for Alignment 1 using Central Avenue northbound and 1st Avenue southbound under the UPRR, these two modes were not evaluated for this alignment in Tier 2 because the preliminary investigation at the beginning of the Tier 2 screening concluded that the vertical clearance (height) of the Central Avenue underpass at the UPRR and Jackson Street would prevent either rail mode from travelling through the underpass without modifying the structure.

The alternatives selected for Tier 2 evaluation were subjected to a more detailed analysis that included mobility improvements, access improvements, traffic impacts, right-of-way (ROW) impacts, environmental impacts, land use and economic development impacts, capital and operating and maintenance costs, cost effectiveness (how the cost of the alternative would compare with its ridership), operating efficiencies and community support. Performance measures were then developed for each criterion to compare how well each alternative performed. The team defined qualitative and quantitative performance measures where reasonable. Table 2-2 summarizes major findings of the screening.

Based on the evaluation results and community support for light rail in the Central Avenue corridor, Valley Metro carried forward light rail using Alignment 2 (with Alignment 1 as a possible variant) for more detailed study. Although Alignment 1 was not studied in Tier 2 for reasons identified in the first paragraph of this section, questions still remained as to whether light rail could possibly use Alignment 1 without major design modifications since the route is the most direct and operationally efficient of all the alignments considered. Therefore, it was decided to conduct more detailed investigation of Alignment 1 after completion of Tier 2 of the AA. The investigation and its results are discussed in Section 2.1.3.

FIGURE 2-3: ALTERNATIVE ALIGNMENTS CARRIED INTO TIER 2^a



^a Alignment 1 using either rail mode was subsequently eliminated early in Tier 2 screening and was later reinstated after Tier 2 for reasons explained in the text.

TABLE 2-2: TIER 2 SCREENING MAJOR FINDINGS

Findings
<i>Alignment 2 (1st Ave north of Hadley St) using light rail was by far the strongest performer.</i>
- Alternative received five top ratings; no other alternative received more than two. - The combination of mode and alignment characteristics resulted in likelihood of high ridership and positive impacts on land use and economic development. - Light rail on or near Central Ave garnered more community support than any other alternative. - Subsequent to the preliminary investigation into Alignment 1 (Central Ave/1st Ave one-way couplet north of Hadley St), a more detailed investigation reopened the possibility of light rail using the Central Ave underpass. Therefore, Alignment 1 with light rail was retained as a variant of this alternative for further study.
<i>Despite bus rapid transit's relatively low cost and high ridership potential, this mode was eliminated from further consideration.</i>
Bus rapid transit was eliminated because of: - Lower predicted ridership than light rail - Lower vehicle capacity than light rail makes it more difficult to meet high peak travel demands efficiently - Little history of stimulating desirable economic development and land use patterns - Lack of ability to interline with other high-capacity transit in the region - Low community support
<i>Modern streetcar was eliminated from further consideration.</i>
Modern streetcar was eliminated because of: - Lowest predicted ridership, by far, of any mode - Relatively high cost (poor cost effectiveness) - Operational, reliability and safety concerns related to fixed guideway in mixed traffic - Similarity to existing local bus service, rather than a means to meet regional travel needs - Questionable ability to interline with regional light rail service - Lower community support than light rail
<i>Detouring transit service to 7th Ave (Alignment 5) was eliminated from further consideration.</i>
Transit service on 7th Ave was eliminated because of: - Excessive capital cost of bridging Union Pacific Railroad at 7th Ave (with light rail or modern streetcar) - High cost of detour, bringing little or no ridership gain because the longer and less direct route would discourage patronage - Excessive potential residential right-of-way acquisitions - Less compatible with local plans, compared with Central Ave - Equal or fewer development opportunities, compared with Central Ave - Complicated potential interline with existing and future light rail - Relatively little community support

Source: Valley Metro (2014a)

2.1.3 Refinement of the Leading Alternative Subsequent to Tier 2

The recommendations emerging from Tier 2 of the AA were further investigated and documented in the Valley Metro *South Central Corridor Locally Preferred Alternative Report* (April 2014), including a more detailed evaluation of the Central Avenue

underpass of the UPRR and Jackson Street associated with Alignment 1. The purpose of this evaluation was to more specifically determine whether the underpass could accommodate light rail or modern streetcar without major modifications of the structure. The evaluation included a review of the dimensions of the underpass as well as the minimum vertical clearance of Valley Metro's existing light rail vehicle and a typical modern streetcar.

Through the more detailed evaluation following the Tier 2 screening, it was determined that the previous evaluation had only considered Valley Metro's standard vertical clearance of 16 feet (ft.) 0 inch (in.) for a roadway underpass. The Central Avenue underpass does not provide this clearance. Valley Metro's Design Criteria Manual allows for exceptions to the standard vertical clearance, which are evaluated on a site-specific basis. For this location, a minimum vertical clearance of 13 ft. 0 in. has been established because the Central Avenue light rail alignment at the UPRR and at Jackson Street does not have road vehicles crossing the alignment, and has sufficient distance to transition the trackway from ground level downslope to clear the 13 ft. 0 in. vertical clearance needed through the Central Avenue underpass. By applying the minimal vertical clearance of either rail vehicle, it was determined that the Central Avenue underpass at the UPRR and Jackson Street could accommodate light rail or modern streetcar without requiring structural modifications to the underpass. Therefore, Alignment 2 (1st Avenue north of Hadley Street) was eliminated in favor of Alignment 1 (1st Avenue/Central Avenue one-way couplet north of Hadley Street).

Additionally, Alignment 1 was preferred over Alignment 2 for the following operational purposes:

- Using Alignment 1, light rail or modern streetcar vehicles could operate parallel with automobile traffic throughout the corridor, while Alignment 2 requires northbound rail vehicles to be operating contraflow to automobile traffic on a 0.5-mile segment of the corridor along 1st Avenue between Hadley Street and Madison Street.
- Alignment 1 maintains northbound rail vehicle operations on Central Avenue throughout the corridor, eliminating the out-of-direction travel and two 90-degree turns associated with the northbound deviation to 1st Avenue near Hadley Street and a second deviation required to return to Central Avenue at Madison Street. The elimination of the deviations provides a more direct trip for passengers and reduces the overall travel time in this segment of the corridor.

Prior to completing the AA, Valley Metro formed a Community Working Group (CWG) to provide input on major components of the preferred alternative to be carried forward into the EA. The major components discussed with the CWG included traffic lane configuration, station locations, transit connections, park-and-ride facility need and locations and other physical and operational elements of light rail. The CWG membership included:

- Representatives of local businesses, both large and small
- Local residents
- Not-for-profit community and social service organizations
- Educational institutions and school districts

- Chambers of commerce
- Faith-based organizations

Additional information about the CWG can be found in Section 4.3.2 of Chapter 4.0 of this EA. Among the CWG recommendations are:

- For Central Avenue, maintain two traffic lanes in each direction from Downtown Phoenix to just south of Interstate 17 (I-17) (Watkins Street) and narrow this roadway to one lane in each direction from south of Watkins Street to Baseline Road. The purpose of reducing lanes south of Watkins Street was to minimize the amount of additional ROW needed to accommodate the Build Alternative and to emphasize an orientation toward transit and nonmotorized transportation.
- Consider park-and-ride locations at the southern light rail terminus at Baseline Road and near the Ed Pastor Transit Center.

The Phoenix City Council (December 2013) and the Valley Metro Board of Directors (September 2014) concurred with the recommendations identified in the AA and by the CWG to accept Alignment 1 using light rail as the preferred alternative for more detailed study in this EA.

2.2 WHAT ALTERNATIVES ARE EVALUATED IN THIS ENVIRONMENTAL ASSESSMENT?

As part of this EA, No-Build and Build Alternatives 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 light rail extension. Information on the evaluation of potential environmental issues is provided in Chapter 3.0.

2.2.1 No-Build Alternative

The No-Build Alternative represents conditions in 2035 if the South Central Light Rail Extension Project were not built. It provides a point of comparison with 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” projects to be only those projects contained in the current, fiscally constrained MAG 2035 RTP and the City of Phoenix *Capital Improvement Plan*. 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 roads. Central Avenue is identified as a minor arterial roadway in the RTP with three to four travel lanes. Baseline Road is classified as a major arterial. Southern Avenue, Broadway Road, Lower Buckeye Road, Buckeye Road and Jefferson Street are classified as minor arterial roads. All of these facilities have four lanes, with the exception of Broadway Road, which has five lanes. Table 2-3 displays roadway improvements planned for the No-Build Alternative in the area.

The City of Phoenix, as part of its ongoing traffic signals maintenance program, conducts periodic signal optimization of its traffic signals throughout the city, including the study area. The program involves adjusting signal timing, cycle lengths and offsets and/or splits to accommodate anticipated traffic growth. In areas where the light rail operates, it also includes consideration of light rail operations through the signalized intersections and traffic pattern changes as a result of the proposed Build Alternative.

TABLE 2-3: ROADWAY PROJECTS – NO-BUILD ALTERNATIVE

Project Location	Description
MAG Transportation Improvement Program Fiscal Year 2014–2018	
7th Ave: Southern Ave to Salt River	Reconstruction of the roadway to a consistent, 64-foot-wide cross section to provide pedestrian facilities where such facilities currently do not exist. No increase in auto capacity is included in the project.
Avenida Rio Salado Pkwy: 51st Ave to 7th St	The project includes intersection improvements, roadway widening and extension, sidewalks, bicycle lanes, landscaping and street lighting. Improvements, planned by segment, are as follows: <u>Segment 1:</u> 7th Ave and 7th St Intersections include full intersection improvements, underground utility installation (water, storm drain), Americans with Disabilities Act ramps and traffic signals. <u>Segments 2 and 3:</u> 35th Ave to 17th Ave includes overhead to underground utility conversion, underground utility installation (water, storm drain), full build-out of six-lane arterial (three lanes in each direction), landscaping, flush median, curb, gutter, Americans with Disabilities Act ramps, street lighting, sidewalk and traffic signals. <u>Segment 4:</u> 43rd Ave to 35th Ave includes widening of roadway, full build-out of six-lane arterial (three lanes in each direction), overhead to underground utility conversion, underground utility installation (water, storm drain), landscaping, curb, gutter and street lighting. <u>Segment 5:</u> 51st Ave to 43rd Ave includes full build-out of the southern half of the roadway to include three lanes in each direction with a center median/turn lane, bike lane, curb, gutters, sidewalks, street lighting, landscaping and medians on 51st Ave.
Buckeye Rd: 7th St to 16th St	Provide pedestrian facilities on the southern side of the roadway where no facilities currently exist. No roadway improvements are planned.
Buckeye Rd: Central Ave to 7th St	Provide pedestrian facilities on the southern side of the roadway where no facilities currently exist. No roadway improvements are planned.
Roosevelt St: 3rd St to 7th St	Construct new bicycle lanes, on-street parking and landscaped bump-outs. Additional improvements include the installation of benches, trash receptacles, bike racks and pedestrian lighting.

Note: MAG = Maricopa Association of Governments

2.2.1.2 Transit Service and Facility Improvements

The regional transit system currently serving Phoenix for the No-Build Alternative consists of commuter and local buses, local circulators, a rural connector and the 23-mile existing light rail line that serves areas in Phoenix, Tempe and Mesa. Several light rail stations serve the northern portion of the study area including:

- Roosevelt St/Central Ave, northbound
- Washington St/Central Ave, northbound
- Roosevelt St/1st Ave, southbound
- Jefferson St/1st Ave, southbound

- Van Buren St/Central Ave, northbound
- 3rd St/Washington, westbound
- Van Buren St/1st Ave, southbound
- 3rd St/Jefferson, eastbound

Two separate commuter services provide morning (AM) peak hour connections to Downtown Phoenix. Valley Metro operates peak period express bus service between suburban communities and Downtown Phoenix. The City of Phoenix operates RAPID bus service, which originates at dedicated park-and-ride facilities within city boundaries and provides peak period service to Downtown Phoenix. Local bus service typically operates on arterial streets in a grid pattern and serves a range of local and regional travel needs. Additionally, circulator buses provide access to neighborhood destinations and the core transit system. Downtown Phoenix is principally served by light rail, a local circulator bus, express and RAPID bus commuter services and multiple local bus routes. In addition, the Central Station Transit Center in Downtown Phoenix is one of the metropolitan area's most active transit centers and a major transfer hub.

The No-Build Alternative would include all light rail and fixed-route bus service (local, express and RAPID) currently programmed in the 2035 RTP. Table 2-4 illustrates the basic operating characteristics of transit services with the No-Build Alternative. The No-Build transit network is illustrated in Figure 2-4 for local bus service and in Figure 2-5 for regional transit service.

The only difference between the No-Build transit network and 2015 conditions is that the No-Build Alternative includes improved headways (frequencies) for Route 3 – Van Buren Street. The headways improve from 15 minutes in the peak/off-peak periods under 2015 conditions to 10 minutes in both periods for the No-Build Alternative. All of the routes are the same in both scenarios. Refer to Tables 3-9 and 3-10 in Section 3.6 of Chapter 3.0 for additional information about the current transit network.

TABLE 2-4: NO-BUILD ALTERNATIVE TRANSIT NETWORK

Route	Weekday Headways/Frequencies ^a (minutes)		Existing Daily Ridership ^b
	Peak	Off-peak	
High-capacity Transit			
Light rail	12	12	44,000
Local Buses			
Route 0 – Central Ave	10	20	5,320
Route 1 – Washington St/Jefferson St	30	30	275
Route 3 – Van Buren St	10	10	5,720
Route 7 – 7th St	20	30	4,850
Route 8 – 7th Ave	30	30	2,480
Route 10 – Roosevelt St	30	30	3,140
Route 13 – Buckeye Rd	30	35	1,090
Route 45 – Broadway Rd	15	30	5,246
Route 52 – Roeser Rd	30	30	717
Route 61 – Southern Ave	15	30	6,703

Route	Weekday Headways/Frequencies ^a (minutes)		Existing Daily Ridership ^b
	Peak	Off-peak	
Route 77 – Baseline Rd	30	30	3,554
Circulator Buses			
Phoenix Business Circulator DASH	12	12	2,100
City of Phoenix RAPID			
Central South Mountain East	25–30	None	90
Central South Mountain West	25–30	None	— ^c
I-10 West	10–20	None	675
I-10 East	10–20	None	690
SR 51	10–20	None	560
I-17	10–20	None	1,530
Arizona State University (ASU) Shuttles			
ASU Tempe to Phoenix CBD	60	60	— ^d
ASU Tempe to Phoenix West Campus	30	30	— ^d
Express Buses			
Route 514 – Scottsdale/Fountain Hills	90	None	68
Route 520 – Tempe Express	90	None	46
Route 521 – Tempe Express	45	None	107
Route 522 – Tempe Express	45	None	108
Route 531 – Mesa/Gilbert Express	30	None	270
Route 533 – Mesa Express	30	None	420
Route 535 – Northeast Mesa Express	36	None	300
Route 541 – Chandler Express	45	None	173
Route 542 – Chandler Express	45	None	400
Route 562 – Goodyear Express	45	None	180
Route 563 – Avondale/Buckeye Express	45	None	140
Route 571 – Surprise	45	None	180
Route 573 – Northwest Valley Express	45	None	170
Route 575 – Northwest Valley Express	60	None	170
Grand Avenue Limited ^e	90	None	80

Sources: Valley Metro (2012, 2013, 2014a, 2014b)

Notes: I-10 = Interstate 10, I-17 = Interstate 17, SR = State Route

^a Headway means frequency of service (assumed to remain the same as 2015 conditions for the No-Build Alternative, except for Route 3, where headways would improve).

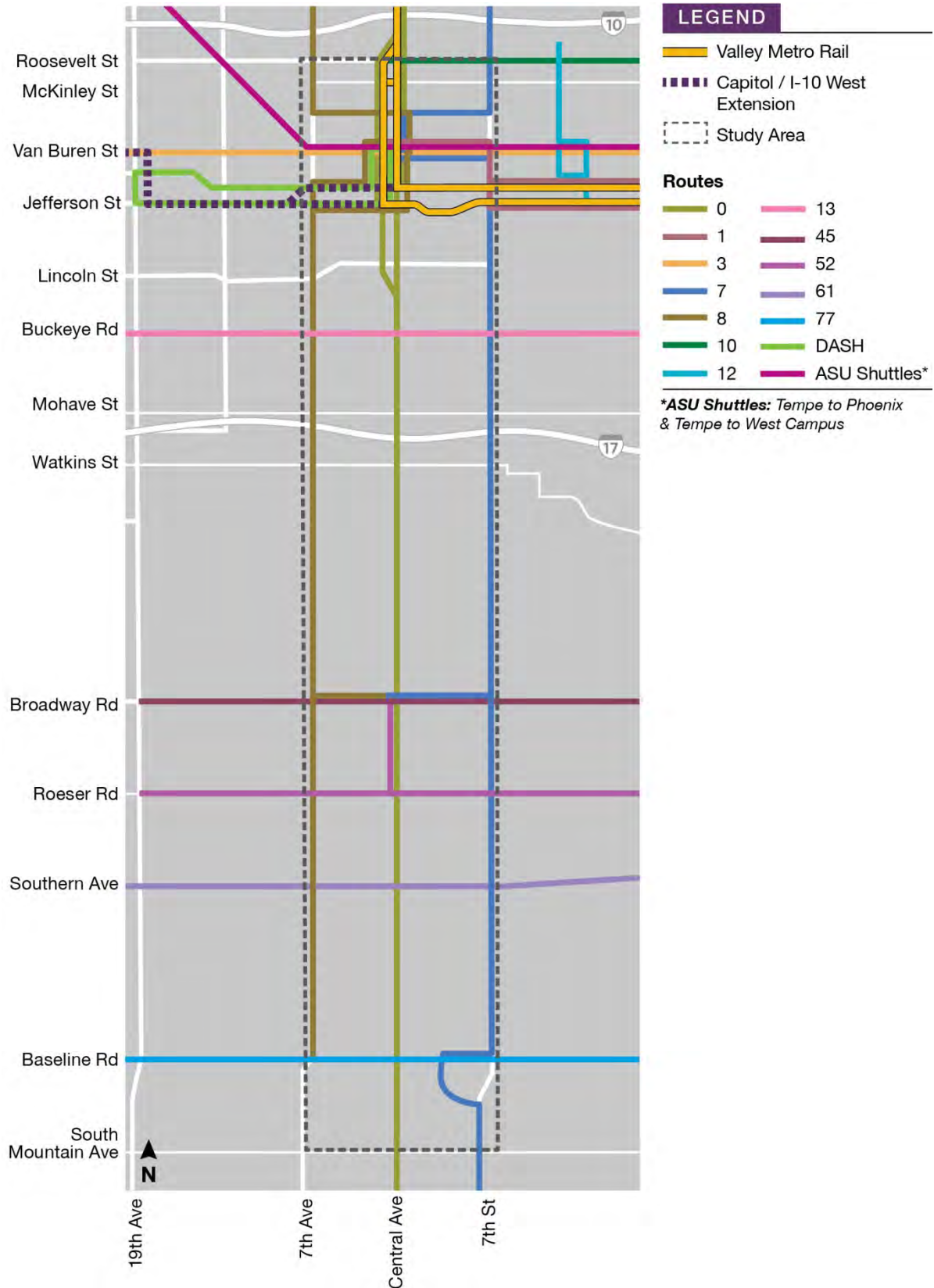
^b From Valley Metro's Annual Ridership Report, FY 2013–2014

^c This route is not included in the STOPS model.

^d ASU Shuttle services operate between ASU campuses and are not open to the public; therefore, ridership data are not available.

^e Local limited-stop service

**FIGURE 2-4: NO-BUILD ALTERNATIVE TRANSIT NETWORK
– LOCAL SERVICE**



**FIGURE 2-5: NO-BUILD ALTERNATIVE TRANSIT NETWORK
– REGIONAL SERVICE**

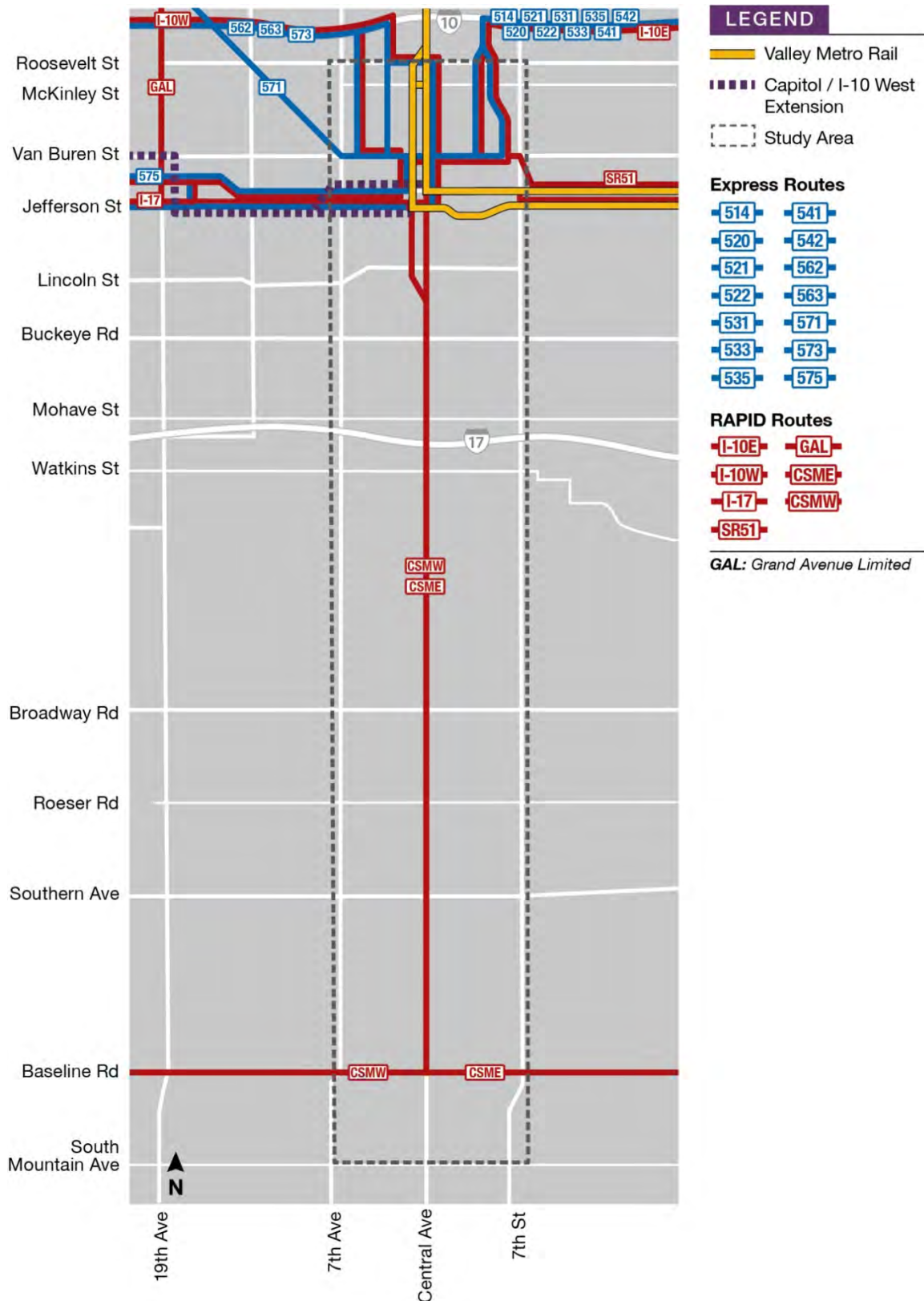


Table 2-5 describes existing and planned transit facilities in the No-Build Alternative study area. Two new transit facilities are planned or programmed for implementation by 2035 in the study area beyond basic maintenance or minor enhancements to existing facilities.

TABLE 2-5: EXISTING AND PLANNED TRANSIT FACILITIES IN STUDY AREA

Facility	Comments
Existing Facilities	
Stops – fixed-route bus	Bus stops, including shelters and open-air stops, are spaced approximately every 1/8 to 1/4 mile on arterial streets served by local bus routes, express routes and the Phoenix Business Circulator DASH. Improved headways are planned on Route 3 (Van Buren St).
Light rail stations	Six light rail transit stations are in the study area: 3rd St/Jefferson, Washington/Central Ave, Jefferson/1st Ave, Van Buren/1st Ave, Van Buren/Central Ave and Roosevelt/Central Ave.
Central Station Transit Center	Served by the current light rail transit line, the Central Station Transit Center includes bus bays for local fixed-route buses, express and RAPID buses and the Phoenix Business Circulator DASH. The transit center is Downtown at Van Buren St between 1st Ave and Central Ave.
Ed Pastor Transit Center	Ed Pastor Transit Center is a bus hub located at the northwestern corner of South Central Ave and Broadway Rd. This transit center currently serves six bus routes, including a RAPID route.
Planned Facilities by 2035	
Capitol/I-10 West Light Rail Extension	The project is scheduled to begin operations in 2023.
Central Station Transit Center	The City of Phoenix is negotiating a federally compliant joint-use development at the current Central Station Transit Center. The joint-use development will support a future transit use.

Sources: Valley Metro (2014a, 2014b)

Note: I-10 = Interstate 10

2.2.2 **Build Alternative**

The Build Alternative discussed in this EA would consist of an approximately 5-mile-long southern extension of the existing Valley Metro light rail line along Central and 1st Avenues in central Phoenix. Like the No-Build Alternative, the Build Alternative represents conditions in 2035. The extension tracks would connect to the existing light rail system at Central Avenue and Washington Street in the northbound direction and at 1st Avenue and Jefferson Street in the southbound direction (Figure 2-6). The track would continue south along 1st and Central Avenues to Hadley Street, where the southbound track would follow the 1st Avenue one-way couplet curve to the east to rejoin Central Avenue. From Hadley Street to the extension's southern terminus at Baseline Road, the tracks would operate bidirectionally along Central Avenue. Primary features of the light rail extension are summarized in Table 2-6. The South Central Light Rail Extension Project is scheduled to begin operations in 2023.

FIGURE 2-6: BUILD ALTERNATIVE

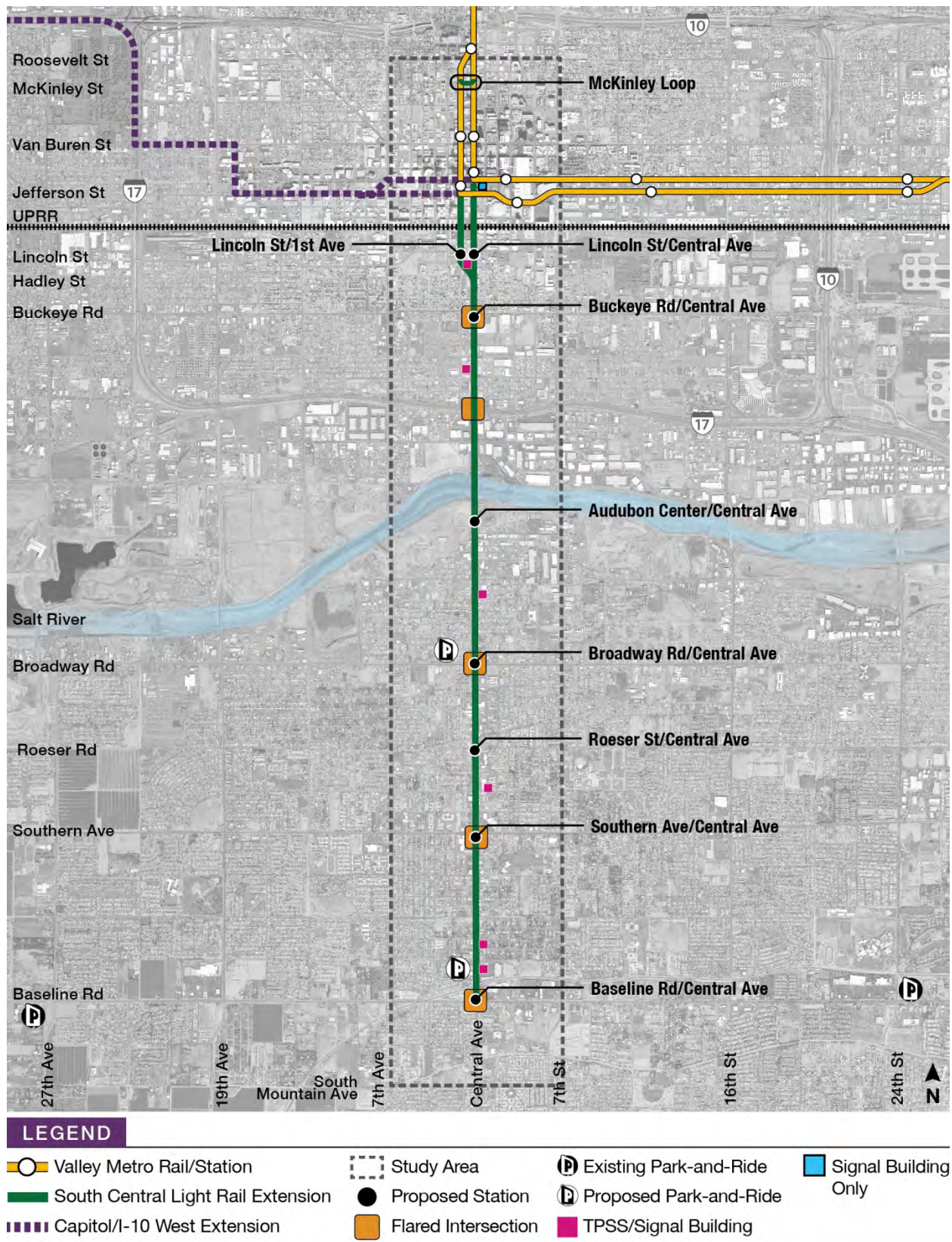


TABLE 2-6: SOUTH CENTRAL LIGHT RAIL EXTENSION AT-A-GLANCE

Feature	Description
From – To:	<u>Central Ave and 1st Ave (one-way couplet); Washington St/Jefferson St (from connection with existing light rail) to Hadley St</u> – This section has a single-track configuration. <u>Central Ave – Hadley St to Baseline Rd</u> – This section has a double-track configuration.
Route distance	Approximately 5 miles
Daily ridership	6,690 ^a
Operations begin	2023
Construction timing and duration	• Timing: 2019 to 2023 • Duration: Approximately 4 years
Trackwork	• Southbound: Side-running track along 1st Ave south of Jefferson St to Lincoln St; transitions to median-running along 1st Ave to Hadley St; follows the 1st Ave one-way couplet curve to the east to rejoin Central Ave and continues median-running to Baseline Rd • Northbound: Median-running track from Baseline Rd to Buchanan St; side-running track between Buchanan St and Madison St; transitions to median-running from Madison St to Jefferson St; transitions back to side-running to connect into existing station north of Jefferson St • Typically at grade except where both the northbound and southbound tracks and roadway go under Union Pacific Railroad and Jackson St (between Buchanan St and Madison St) • Continuously welded steel rails • Track rails embedded in a concrete slab for aesthetic purposes and to provide level and smooth crossings for automobiles and pedestrians where such crossings are allowed <u>Special trackwork</u> • Loop at McKinley St/1st Ave and McKinley St/Central Ave (northern portion of the study area) – provides operational flexibility during special events and in case of track closures by allowing the train to switch tracks • Loop near Sherman St (south of Grant St) to allow trains to change tracks and/or direction • Crossover tracks at Central Ave/Jefferson St to allow light rail vehicle nonrevenue service to operate to the Operations and Maintenance Center near 48th St and Washington St • Crossover tracks to facilitate movement of trains to opposite track at following locations: Sherman St, Cocopah St, Raymond St, Cody Dr, Sunland Ave and Fremont Road/Jesse Owens Pkwy • Central Ave/Baseline Rd station would have four tracks: two for loading and unloading passengers on the station platform in both directions and two outside tracks for temporary train storage

Feature	Description
Stations	Eight new stations would be provided at: - Lincoln St/1st Ave (southbound) - Lincoln St/Central Ave (northbound) - Buckeye Rd/Central Ave - Audubon Center/Central Ave - Broadway Rd/Central Ave - Roeser St/Central Ave - Southern Ave/Central Ave - Baseline Rd/Central Ave (southern terminus) The light rail extension would tie into the existing light rail tracks just south of the existing stations at Washington St/Central Ave (northbound operations) and Jefferson/1st Ave (southbound operations). Here, the South Central trains would interline with the existing light rail line and continue north to serve all existing stations between Washington St/Jefferson St and the line's terminus at Dunlap Ave/19th Ave.
Light rail vehicles	18 – consists of 15 revenue service vehicles and 3 spare vehicles - Vehicle specifications similar to Valley Metro's existing fleet for system operability - Carry approximately 175 passengers per vehicle - Average operating speed of approximately 20 miles per hour, with a maximum speed of 35 miles per hour - Could operate as a two- or three-car train depending on demand (two-car train would be the most common configuration)
Traffic lanes	Light rail would operate in semiexclusive guideway separate from vehicular traffic, except at signal-protected intersections, which would require changes in the configuration of traffic lanes as follows: <u>Southbound</u> 1st Ave from Jefferson St to Lincoln St, including the pass under the Jackson St bridge and Union Pacific Railroad (UPRR) bridge, traffic lanes reduced from three through lanes to two through lanes with turn pockets at minor signalized intersections 1st Ave from Lincoln St to Hadley St, traffic lanes reduced from two through lanes to one through lane with left-turn pocket at minor signalized intersection - Central Ave from Hadley St to Apache St, traffic lanes reduced from two in each direction to one in each direction with left-turn pockets at minor signalized intersections - Central Ave from approximately Apache St to Watkins St, including the pass under the Interstate 17 (I-17) bridge, two through traffic lanes maintained each direction with left turn pocket at I-17 frontage roads - Central Ave from Watkins St to Baseline Rd, including the Salt River bridge and Western Canal bridge, traffic lanes reduced from two in each direction to one in each direction with left-turn pockets at minor signalized intersections - At Buckeye Rd/Central Ave, Broadway Rd/Central Ave, Southern Ave/Central Ave and Baseline Rd/Central Ave, intersections flare to include one through lane, one dedicated left-turn lane and one shared lane for bicycles and right turns

Feature	Description
Traffic lanes (continued)	<u>Northbound</u> - Central Ave from Baseline Rd to Watkins St, including the Salt River bridge and Western Canal bridge, traffic lanes reduced from two in each direction to one in each direction with left-turn pockets at minor signalized intersections - Central Ave from approximately Watkins St to Apache St, including the pass under the I-17 bridge, two through traffic lanes maintained each direction with left-turn pocket at I-17 frontage roads - Central Ave from Apache St to Lincoln St, traffic lanes reduced from two through lanes to one in each direction with left-turn pockets at minor signalized intersections - Central Ave from Lincoln St to Madison St, including the pass under the UPRR bridge and the Jackson St bridge, traffic lanes reduced from three through lanes to two through lanes - Central Ave from Madison St to Jefferson St, traffic lanes reduced from three through lanes to two dedicated right-turn lanes - Central Ave from Jefferson St to Washington St, including the pass under the CityScape pedestrian bridge, roadway closed to through traffic - Flared intersections as described for the southbound direction <u>Roundabouts</u> - Central Ave at Victory St - Central Ave just south of the Salt River in front of the Audubon Center <u>I-17 Frontage Roads</u> - Relocation of frontage roads away from the Interstate 17 bridge
Sidewalks/ Bicycle routes	- Sidewalks to be maintained as currently exist - The Build Alternative would maintain bicycle routes as they currently exist, with some reconfiguration. In some locations the bicycle lane would share right-of-way (ROW) with the dedicated right-turn lane and, in others, bicycle lanes may shift to the opposite side of the street. - The Build Alternative would add the following bicycle lanes to provide continuous bicycle facilities along the alignment: - Southbound on 1st Ave between Madison St and Lincoln St - Southbound on Central Ave between Riverside St and Broadway Rd - Southbound and northbound (both directions) on Central Ave between Southern Ave and Baseline Rd
Bridge modifications at Salt River	- Remove and replace center portion of bridge deck and concrete girders so that the current bridge can support the additional periodic weight of light rail vehicles. - Reduce travel lanes from two in each direction to one in each direction to accommodate the light rail vehicles and trackwork. - Thicken each existing bridge pier footing with concrete. - Replace existing abutments with a new cap beam/column substructure element.
Headways for proposed rail line operations	12-minute frequency in each direction for most of the day, and 20 minutes during late night and early morning hours. Headways by time period are presented below: 5 a.m.–6 a.m.: 20 minutes 6 a.m.–7 p.m.: 12 minutes 7 p.m.–12 a.m.: 20 minutes 12 a.m.–3 a.m.: 20 minutes (Friday and Saturday only)

Feature	Description
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.)
Fares	• \$2 per ride or \$4 for rides all day based on current fare structure for light rail system and regional bus service. • The full fare structure can be found at http://www.valleymetro.org/paying_your_fare. The fare structure is regularly monitored and may be adjusted periodically.
Overhead catenary system	Distributes electricity to light rail vehicles, traction power substations (TPSSs) and signaling and communication systems: • Steel poles support power line: - Pole height: about 25 feet - Pole spacing: typically 90 to 170 feet • Poles normally located between the two bidirectional tracks; sometimes located on the side of the light rail trackway with the overhead electrical line suspended over the light rail tracks
TPSSs	• Supply electricity for light rail operations • Approximate site right-of-way requirements: - Structure: 25 by 47 feet - Total site (access, utilities, setbacks, etc.): 65 by 90 feet • Six TPSS sites being considered; only five would be selected: - Northwestern corner Central Ave/Hadley St - Northwestern corner Central Ave/Cocopah St - Southeastern corner Central Ave/Raymond St - Northeastern corner Central Ave/Sunland Ave - Northeastern corner Central Ave/Carter Rd - Southeastern corner Central Ave/Jesse Owens Pkwy
Signal buildings	• Generally combined with TPSSs, with the exception of a signal building only near Central Ave and Jefferson St at CityScape^b • Signal building without TPSS approximate site requirements: - Structure: 16 by 39 feet - Total site: 56 by 80 feet • Signal building combined with TPSS: - Structure: 25 by 65 feet - Total site: 65 by 105 feet
Operations and maintenance	Existing Valley Metro Operations and Maintenance Center, southeast of 41st St/ Washington St, would be expanded to include: • Seven new storage tracks to increase vehicle storage capacity • A second cleaning platform • Expansion of the Maintenance of Equipment building including modifications or extension of the existing mezzanine, office space, inspection pits and cranes • All improvements accommodated within the footprint of the existing Operations and Maintenance Center; no additional property would be acquired

Feature	Description
Park-and-ride	- Broadway Rd/Central Ave: A 70- to 80-space park-and-ride lot to be built on City of Phoenix-owned property adjacent to the Ed Pastor Transit Center - Baseline Rd/Central Ave: An optional approximately 365 space park-and-ride lot would be constructed on the western side of Central Ave just south of Fremont Rd. Additionally, passengers could use the existing park-and-ride lots west and east of this location at 27th Ave/Baseline Rd and 24th St/Baseline Rd, respectively; local Routes 77 and 77B would provide frequent service (15 minutes all day) between the park-and-rides and the light rail terminus at Baseline Rd/Central Ave

^a FTA Stops projection daily linked trips on Build Alternative for 2013

^b This signal house is in a dense urban environment that is continually changing. During final design, the location of the signal house would be determined. As is typical in this type of environment, the signal house would likely be located in an existing parking structure, basement or utility vault.

The following sections provide a detailed definition of the Build Alternative. Conceptual engineering plans are in Appendix A.

2.2.2.1 Trackwork

The southbound track would be side-running from its connection with the existing light rail system on 1st Avenue south of Jefferson Street to Lincoln Street, where it would transition to median-running and continue along the curved 1st Avenue segment of the one-way couplet before rejoining Central Avenue at Hadley Street. On Central Avenue, it would continue running in the median southbound to its terminus at Baseline Road. The northbound track would be median-running along Central Avenue from Baseline Road north to Buchanan Street, where it would transition to side-running and continue north to Madison Street. North of Madison Street, the track would transition back to median-running as it approaches its connection with the existing light rail system on Central Avenue at Washington Street.

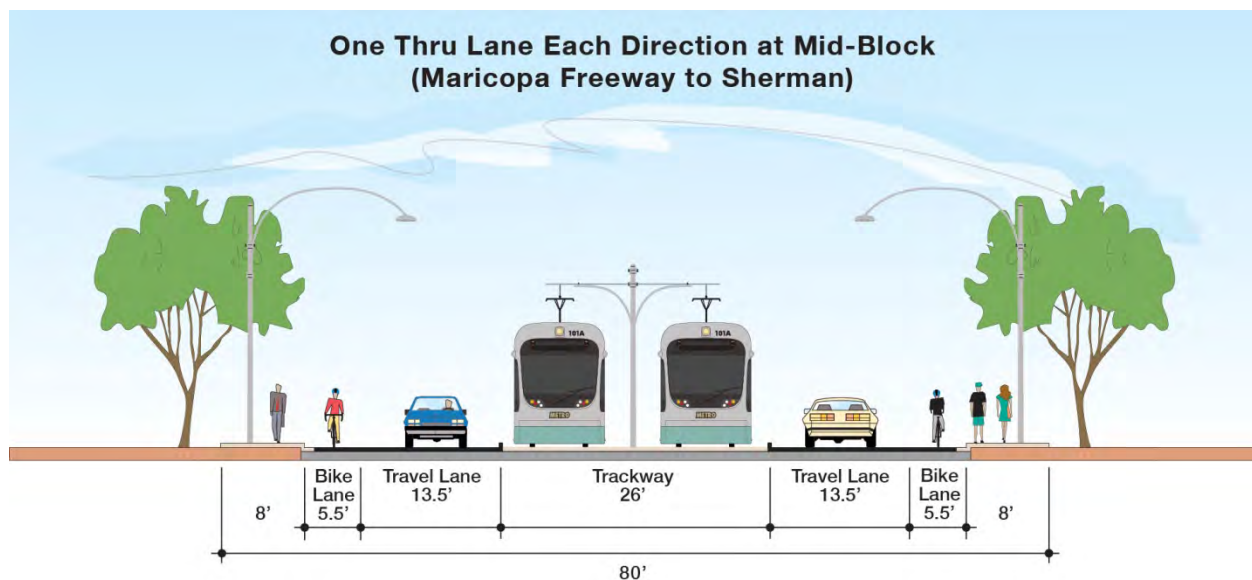
Additional trackwork improvements would be provided at the existing loop in Downtown Phoenix at McKinley Street and Central Avenue and McKinley Street and 1st Avenue. The additional trackwork at this location would help maintain system operations and provide operational flexibility during events that may cause guideway closures such as accidents, disabled light rail vehicles or loss of electrical power in the Downtown segment of the system. Similar trackwork would be provided at Sherman Street and Central Avenue. Together, this would facilitate a short and efficient bus bridge through Downtown Phoenix in the event of a guideway closure. The McKinley Street and Sherman Street trackwork are shown in Figure 2-7.

The alignment is primarily at grade, with the exception of where Central and 1st Avenues go under the UPRR and Jackson Street overpasses between Buchanan and Madison Streets. The track guideway would be exclusively reserved for light rail vehicles, physically separated from automobile traffic by a barrier such as a trackway curb. Typical cross sections are displayed in Figures 2-8 to 2-15.

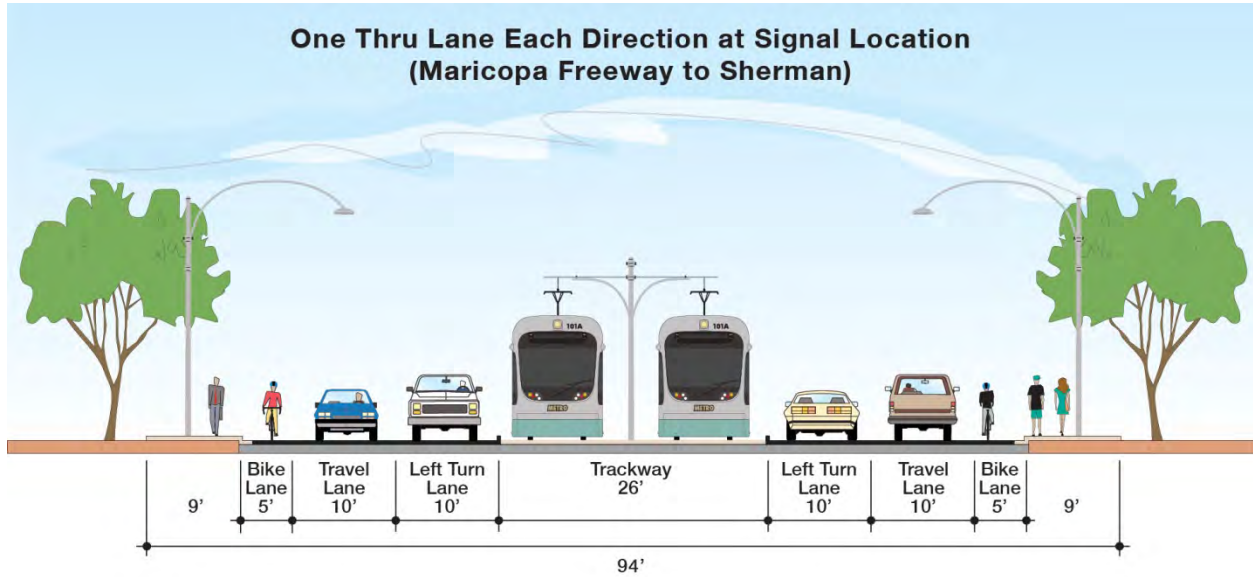
FIGURE 2-7: BUILD ALTERNATIVE LOOPS



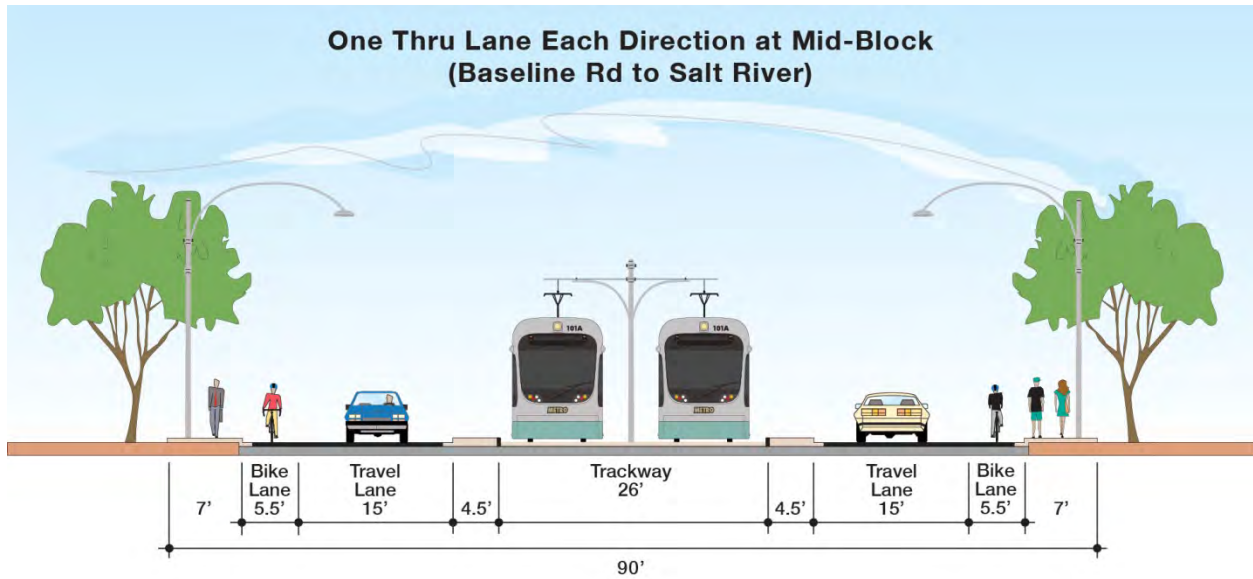
**FIGURE 2-8: TYPICAL CROSS SECTION – MID-BLOCK
(MARICOPA FREEWAY [I-17] TO SHERMAN ST)**



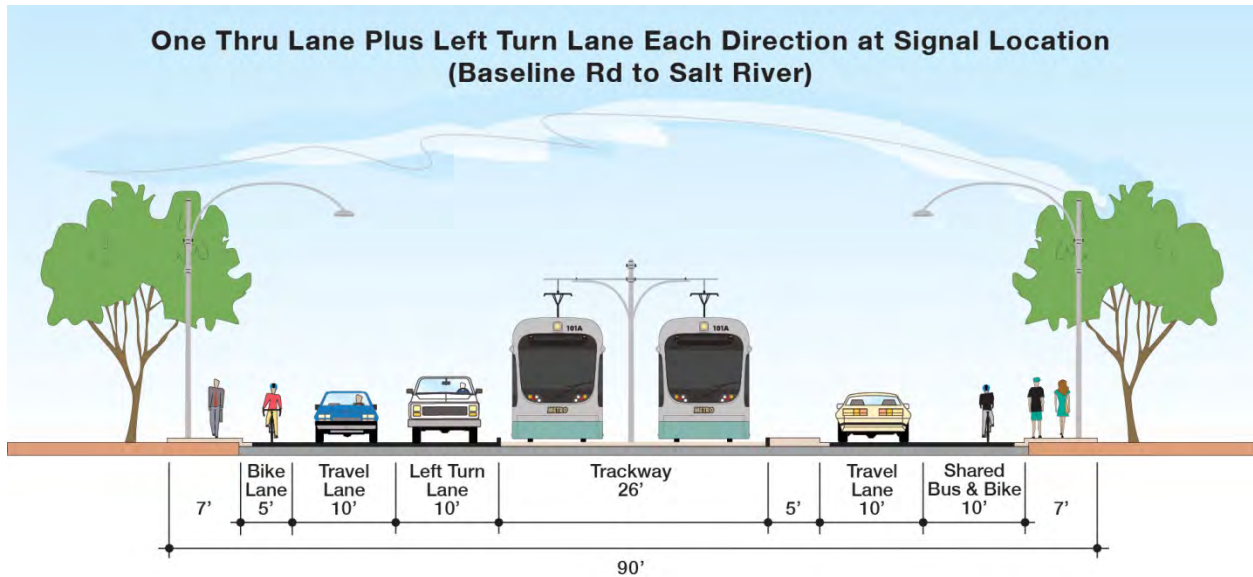
**FIGURE 2-9: TYPICAL CROSS SECTION – SIGNAL LOCATION
(MARICOPA FREEWAY [I-17] TO SHERMAN ST)**



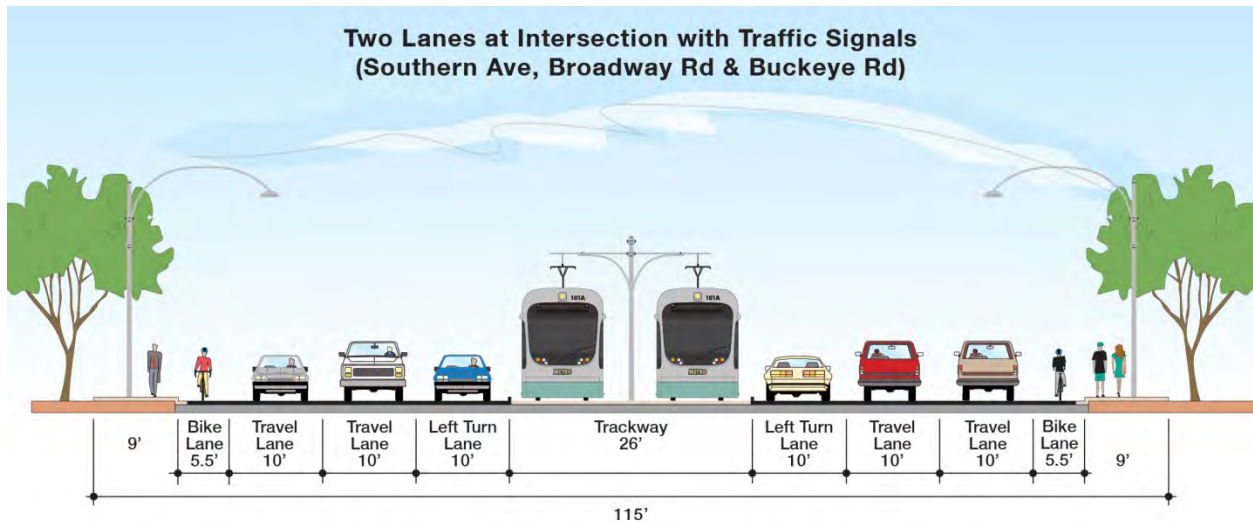
**FIGURE 2-10: TYPICAL CROSS SECTION – MID-BLOCK
(BASELINE RD TO SALT RIVER)**



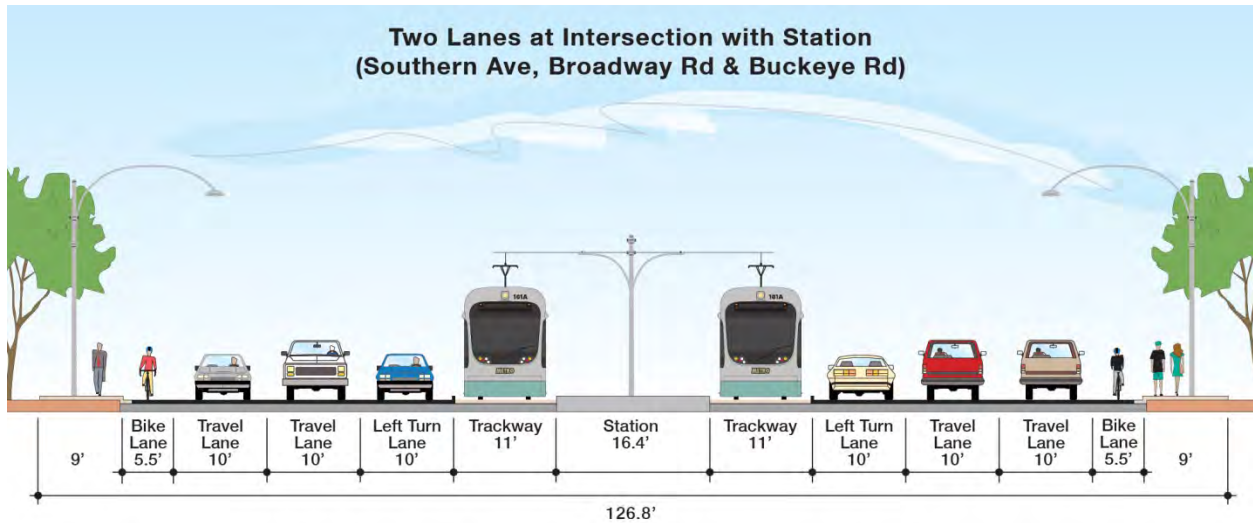
**FIGURE 2-11: TYPICAL CROSS SECTION – SIGNAL LOCATION
(BASELINE RD TO SALT RIVER)**



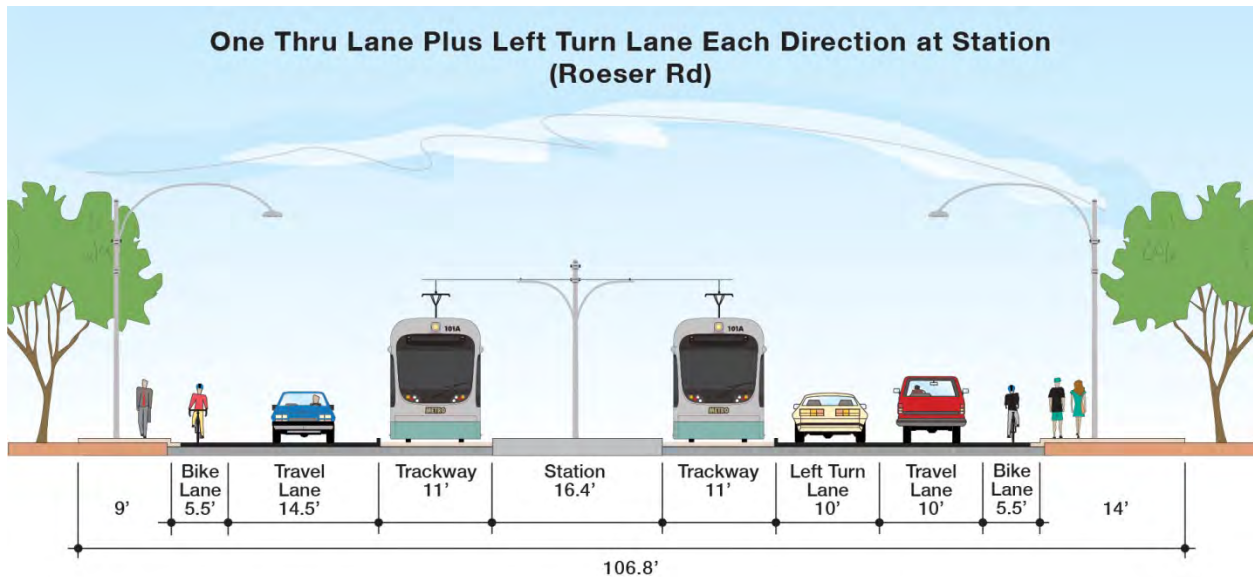
**FIGURE 2-12: TYPICAL CROSS SECTION – INTERSECTION AT SIGNAL
(SOUTHERN AVE, BROADWAY RD, BUCKEYE RD)**



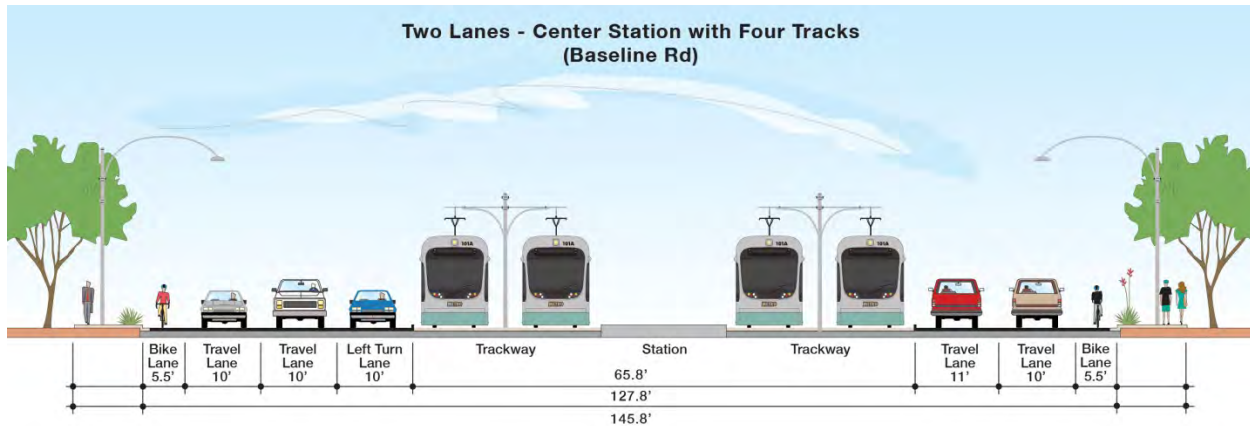
**FIGURE 2-13: TYPICAL CROSS SECTION – INTERSECTION AT STATION
(SOUTHERN AVE, BROADWAY RD, BUCKEYE RD)**



**FIGURE 2-14: TYPICAL CROSS SECTION – INTERSECTION
AT STATION (ROESER RD)**



**FIGURE 2-15: TYPICAL CROSS SECTION – INTERSECTION
AT STATION (BASELINE RD – END-OF-LINE)**



2.2.2.2 Stations

The Build Alternative would consist of eight planned stations along the route, as shown in Table 2-7. The platforms would be about 280 feet long by 16 feet wide to accommodate up to three-car trains; however, trains would typically have two cars. Like existing Valley Metro light rail stations, those on the South Central Light Rail Extension are expected to include such amenities as seating, low-water landscaping, unobtrusive shade, trash receptacles, static and dynamic signs and ticket vending and validation machines. Access to and from adjacent streets would be provided by the appropriate passenger circulation elements such as platforms, sidewalks, ramps and stairs. The Build Alternative could be interlined with the existing light rail line so that those passengers destined as far north as the light rail line terminus at Dunlap Avenue/ 19th Avenue could do so without transferring to another train.

TABLE 2-7: PLANNED STATION LOCATION, BY TYPE

Location	Platform Type	Direction(s) Serving
Lincoln St/1st Ave	Side platform on east curb	Southbound
Lincoln St/Central Ave	Side platform on west curb	Northbound
Buckeye Rd/Central Ave	Center platform	Both directions
Audubon Center/Central Ave	Center platform	Both directions
Broadway Rd/Central Ave	Center platform	Both directions
Roeser St/Central Ave	Center platform	Both directions
Southern Ave/Central Ave	Center platform	Both directions
Baseline Rd/Central Ave	Center platform	Both directions

2.2.2.3 Traffic and Roadway Modifications

Accommodating both automobile traffic and light rail operations while minimizing additional ROW needs would require changes to the traffic configuration along portions of the existing roadways. In addition, the traffic signals along Central Avenue would be

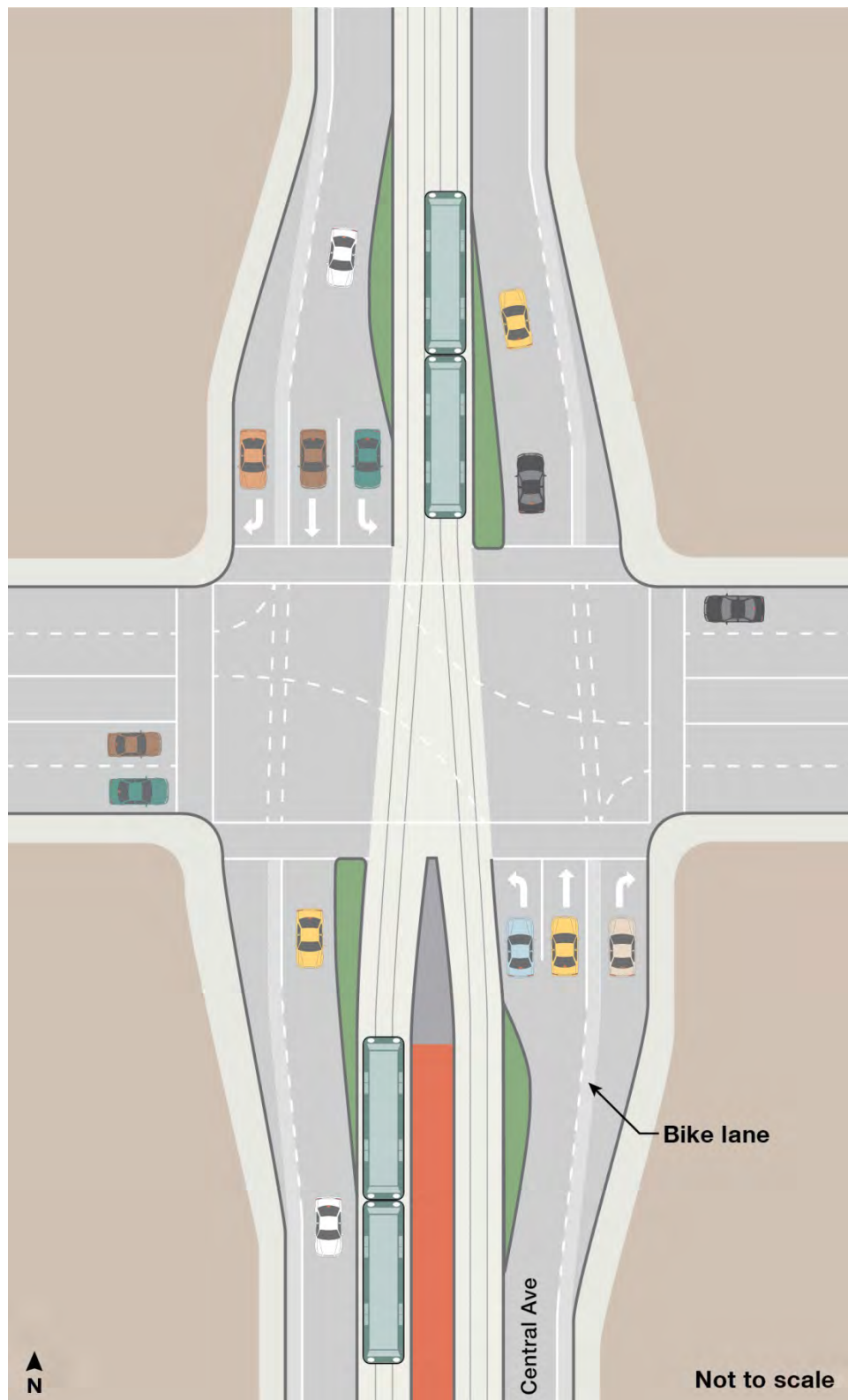
optimized, as part of the City of Phoenix ongoing signal maintenance program, to maximize traffic movements and minimize stops and delays along the corridor.

This section details the proposed modifications and provides the sheet number(s) of the drawings in Appendix A for the reader to reference for graphical detail of each modification. In the southbound direction, traffic lanes on 1st Avenue from Jefferson to Lincoln Streets (Sheets 3 to 5) would be reduced from three through lanes to two through lanes with turn pockets at minor intersections. On the portion of 1st Avenue from Lincoln to Hadley Streets, the number of through lanes would be reduced from two lanes to one lane with a left-turn pocket at Hadley Street (Sheets 5 and 6). Upon rejoining Central Avenue at Hadley Street, southbound traffic lanes would be reduced from two lanes to one lane for the remainder of the corridor (Sheets 6 to 20). In the northbound direction, traffic lanes on Central Avenue from Baseline Road to Hadley Street would be reduced from two through lanes to one through lane with left-turn pockets at minor intersections (Sheets 20 to 6). On the portion of Central Avenue from Hadley to Lincoln Streets, the number of through lanes would be reduced from three lanes to one lane (Sheets 5 and 6). On Central Avenue north of Lincoln Street, the number of through lanes would be reduced from three to two lanes (Sheets 3 to 5).

Flared intersections (to include one through lane, one dedicated left-turn lane and one shared lane for bicycles and right turns in each direction) would be provided at four locations along Central Avenue: Buckeye Road (Sheet 6), Broadway Road (Sheet 13), Southern Avenue (Sheets 16 and 17) and Baseline Road (Sheet 20). The Central Avenue bridge over the Salt River would be reduced from four travel lanes to two travel lanes (Sheets 9 and 10). A typical plan view of a flared intersection at these four locations is illustrated in Figure 2-16. A flared intersection at Central Avenue and I-17 (Sheet 8) would also be provided and would include two through lanes and one dedicated left-turn lane in each direction.

The I-17 frontage roads would be shifted to the north and to the south away from I-17 where they intersect with Central Avenue (Sheet 8). This would allow adequate clearance of vehicles crossing perpendicular to the light rail overhead catenary system (OCS). The current vertical clearance of the I-17 bridge over Central Avenue is 13 feet-11 inches; this dimension is less than Valley Metro's desired minimum design standard of 16 feet-0 inches. LRT vehicles can operate within the current vertical clearance, but to reduce the risk of frontage road traffic striking the high-voltage light rail OCS, both frontage roads would be moved outward from their current alignment up to 85 feet to provide clearance for higher-profile vehicles (for example, large trucks) crossing under the OCS.

FIGURE 2-16: TYPICAL FLARED INTERSECTION



Modern roundabouts would be built at two locations along Central Avenue (Victory Street [Sheet 11] and south of the Salt River just north of the existing access to the Audubon Center [Sheet 10]). The track through both roundabouts would be median running, allowing the movement of light rail vehicles through the center of the roundabouts. Through traffic and right-turn movements would be allowed when the train is approaching and passing through the roundabouts. Left-turn and U-turn movements would be restricted by train-activated crossing gates as the train approaches. Modern roundabouts have the advantage of reducing train travel times by allowing trains to maintain more consistent speeds as compared with stopping at signalized intersections. The roundabouts may also increase intersection capacity and improve traffic progression through intersections. In addition, turning movements would be simpler to maneuver, especially to and from the intersecting streets because access to these streets from either direction would be permitted. Figure 2-17 illustrates roundabouts along the Salt Lake City light rail system.

FIGURE 2-17: MODERN ROUNDABOUTS – SALT LAKE CITY LIGHT RAIL



2.2.2.4 Bridge and Underpass Structures

The proposed Build Alternative would use several underpasses and bridges along its route. The drawing sheet(s) in Appendix A are referenced below for further information about proposed modifications. Between Jefferson and Washington Streets, northbound light rail vehicles would travel under a pedestrian bridge connecting the east and west sides of CityScape (Sheet 3). Between Jackson Street and UPRR, southbound light rail vehicles would travel through two underpasses along 1st Avenue: one at Jackson Street and one at UPRR (Sheet 4). Northbound light rail vehicles on Central Avenue would pass through one longer underpass that crosses under both Jackson Street and UPRR (Sheet 4). The deck above accommodates parking between Jackson Street and UPRR. Central Avenue also passes under I-17 (Sheet 8). Additionally, the alignment would use the Central Avenue bridge over the Salt River (Sheets 9 and 10) and would cross over the Western Canal (Sheet 19).

To accommodate southbound light rail vehicles and OCS on 1st Avenue passing under Jackson Street without changing the slope of 1st Avenue, the Jackson Street bridge deck spanning 1st Avenue would be narrowed by approximately 6 feet (Sheet 4). This would be accomplished by removing the bridge's two northernmost girders. The narrowed bridge would continue to accommodate two-way automobile, pedestrian and bicycle traffic after modifications. To accommodate northbound light rail vehicles through the Jackson Street underpass on Central Avenue, no changes are needed to the bridge structures (Sheet 4). However, the grade in the left tunnel (looking north)

would need to be replaced to achieve a 6 percent grade for the light rail tracks and the appropriate vertical curves. The right tunnel would be retained at existing grades for motor vehicle traffic.

To accommodate the light rail vehicles' vertical clearance requirements, a decorative panel on the bottom of the pedestrian bridge would need to be removed. As outlined in the previous discussion of traffic roadway modifications, accommodating light rail and vehicular traffic in the underpass of I-17 would require relocating the eastbound and westbound frontage roads away (to the south and north, respectively) from their current alignment adjacent to the freeway (Sheet 8) to allow adequate clearances.

A structural analysis of the bridge over Salt River concluded that certain components of the bridge cannot support the weight of both traffic and light rail trains. The following actions would be taken to retrofit, modify and strengthen the bridge to withstand the additional weight of both transportation modes: add a new bridge deck and four new girder lines for the bridge's entire length, thicken all pier footings and replace existing abutments with a new cap beam/column substructure element. To accommodate both traffic and light rail, this concept would reduce the number of traffic lanes from two to one in each direction for automobiles and trucks (Sheets 9 and 10). The bridge currently has two travel lanes in each direction (four lanes total), a raised center median and separated sidewalks on both sides.

The Western Canal bridge would be widened from approximately 90 to 160 feet to accommodate the light rail and stations. The deck of the existing Western Canal bridge would be replaced, and the lanes would be reduced from two to one in each direction (Sheet 19).

2.2.2.5 Park-and-ride

Figure 2-6, shown earlier, illustrates locations of the two park-and-ride facilities for the Build Alternative. A proposed park-and-ride lot would be built to accommodate 70 to 80 vehicles near Central Avenue and Broadway Road. The lot would be built on property owned by the City of Phoenix west of and adjacent to the Ed Pastor Transit Center.

Parking for the end-of-line station at Baseline Road/Central Avenue would be provided in two ways: (1) a proposed park-and-ride lot and (2) enhanced bus service between the Baseline Road/Central Avenue end-of-line light rail station and two existing park-and-ride facilities along Baseline Road.

The proposed park-and-ride lot near the Baseline Road/Central Avenue station would accommodate approximately 365 parking spaces and would be on the western side of Central Avenue between the northern end of the station and Fremont Road. As noted in Section 3.1.3.3 of Chapter 3.0, the proposed park-and-ride would require six parcels (consisting of four total acquisitions and two partial acquisitions) totaling approximately 151,145 square feet (sq ft.). No buildings would be affected.

Existing park-and-ride lots are both west and east of the end-of-line station at 27th Avenue/Baseline Road and 24th Street/Baseline Road, respectively. Local Route 77 already serves both lots and includes a stop at Baseline Road/Central Avenue. Route 77B would be added as an overlay service for these same areas. Combined, these two routes would provide frequent service (15-minute frequencies all

day) between the existing park-and-rides and the light rail terminus at Baseline Road/Central Avenue. See the discussion of the Build Alternative transit network below for additional information.

2.2.2.6 Operations and Maintenance Center Expansion

In conjunction with the Build Alternative, Valley Metro plans to expand the existing OMC, east of Phoenix Sky Harbor International Airport and southwest of the intersection of the Grand Canal and Loop 202 (Figure 2-18). The OMC expansion would include modifications to the MOE building, storage tracks and cleaning platform. The MOE building modifications would consist of an approximately 23,000-square-foot expansion to the east with improvements/modifications to the existing mezzanine, office space, inspection pits and cranes. Expansion of vehicle storage would include construction of seven new storage tracks (north and south of the existing storage tracks) to increase total storage capacity at the OMC. The storage tracks at the OMC were designed to accommodate 35 vehicles; however, the current Valley Metro fleet is 50, necessitating that vehicles be stored in locations other than the storage tracks (that is, inside the MOE building, the wash facility and along the yard lead). The OMC expansion would accommodate approximately 100 vehicles on the storage tracks themselves, allowing for more efficient operations at the OMC.

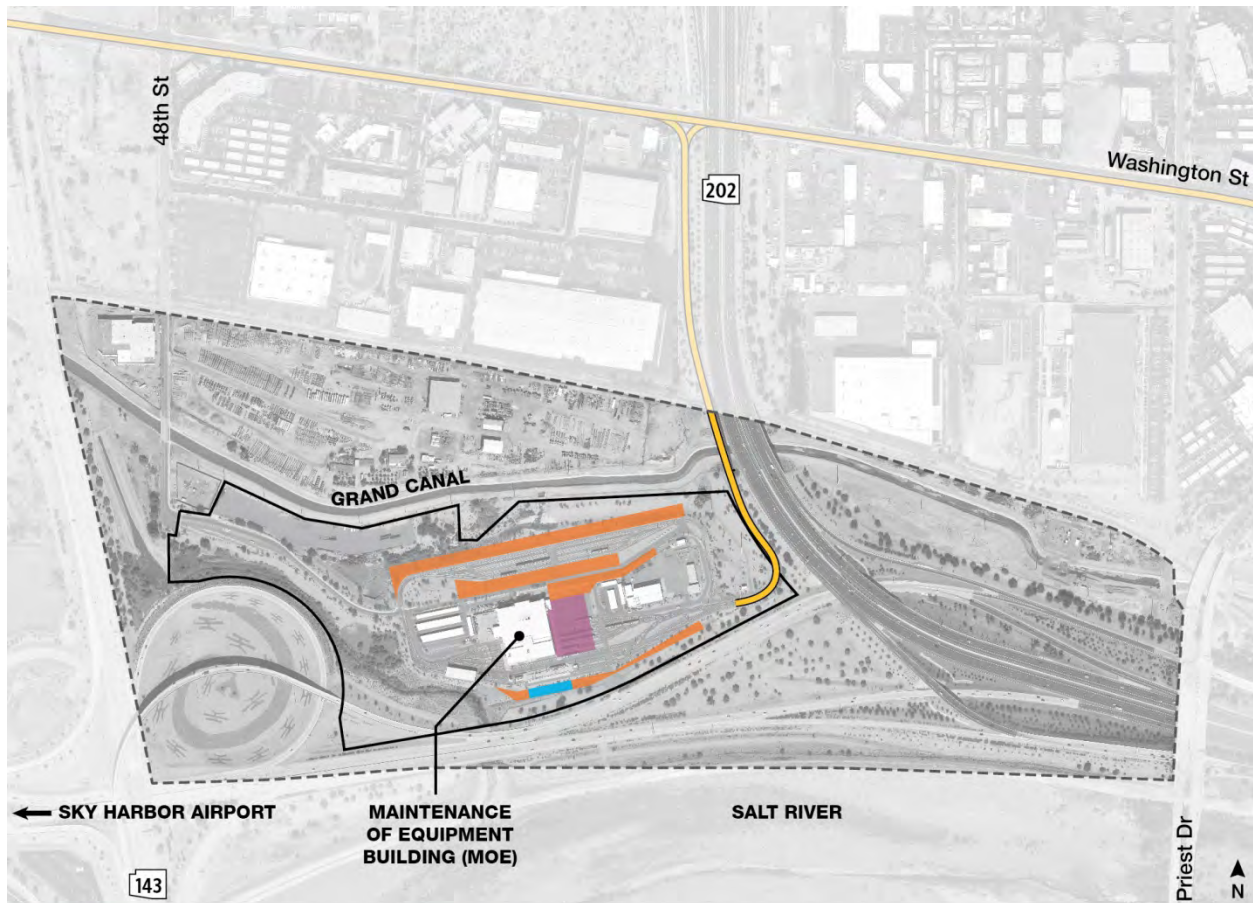
Finally, two new tracks and a second cleaning platform would be constructed south of the existing cleaning platform. The OMC expansion would occur within the existing facility boundaries; thus, no additional property would be required.

2.2.2.7 Build Alternative Freeway/Highway/Road Improvements and Transit Network

Roadway improvements planned for the Build Alternative are the same as those described for the No-Build Alternative in Section 2.2.1.1.

The Build Alternative would support a transit network that provides riders with a connection between fixed-route buses, circulators and light rail. Figure 2-19 depicts the Build Alternative transit network for local fixed-route services, and Figure 2-20 displays the network for regional transit services. Table 2-8 lists transit service in the study area for the Build Alternative and summarizes the respective peak and off-peak headways. Passengers on Route 3, Van Buren Street, would be served by the same headway improvement as the No-Build Alternative of 10 minutes during both the peak and off-peak periods.

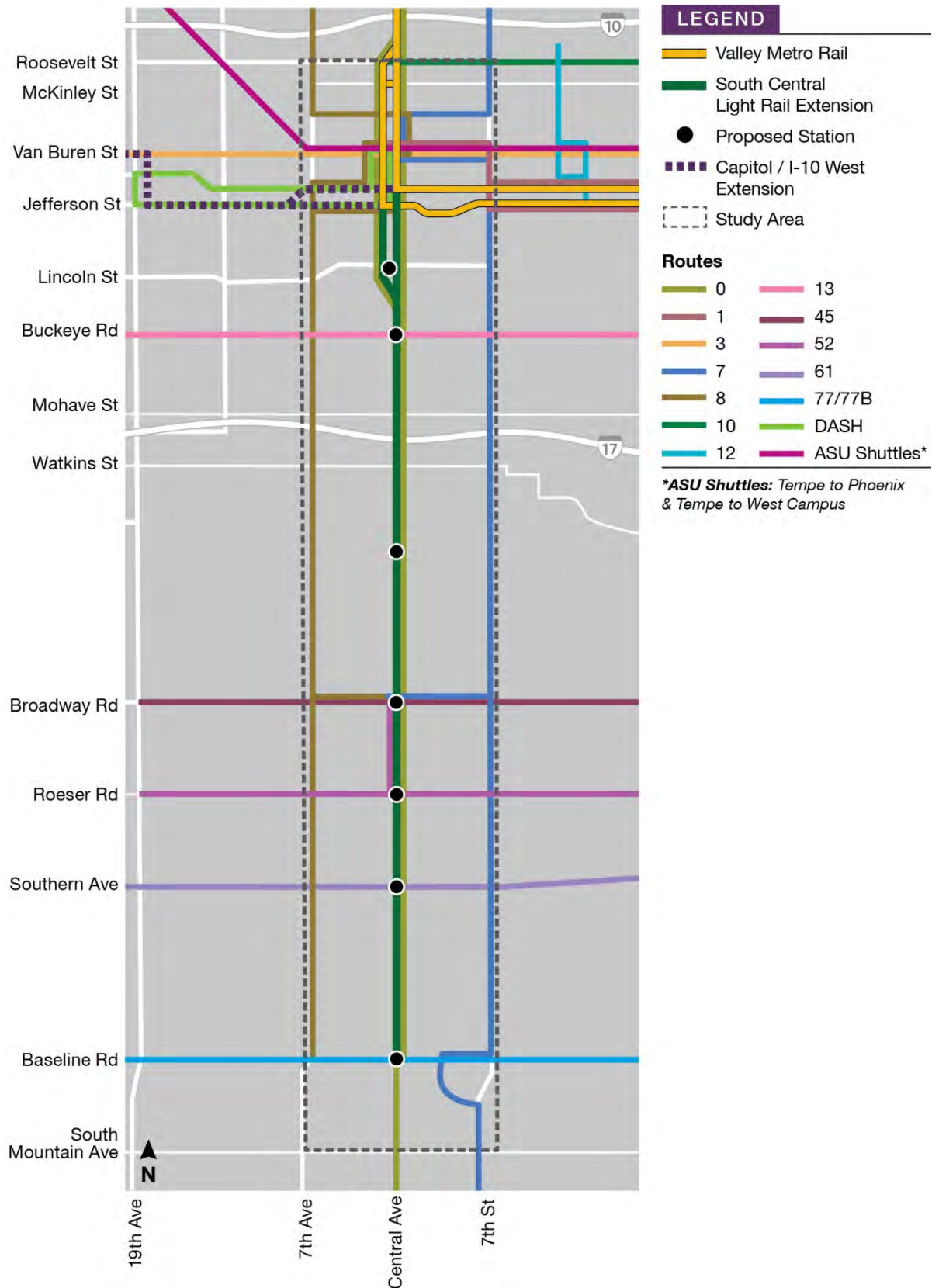
FIGURE 2-18: OPERATIONS AND MAINTENANCE CENTER EXPANSION



LEGEND

 Existing Valley Metro Rail	 Trackwork Expansion
 Study Area	 MOE Expansion
 Operations and Maintenance Center (OMC) Boundary	 Cleaning Platform Expansion

**FIGURE 2-19: BUILD ALTERNATIVE TRANSIT NETWORK
– LOCAL SERVICE**



**FIGURE 2-20: BUILD ALTERNATIVE TRANSIT NETWORK
– REGIONAL SERVICE**

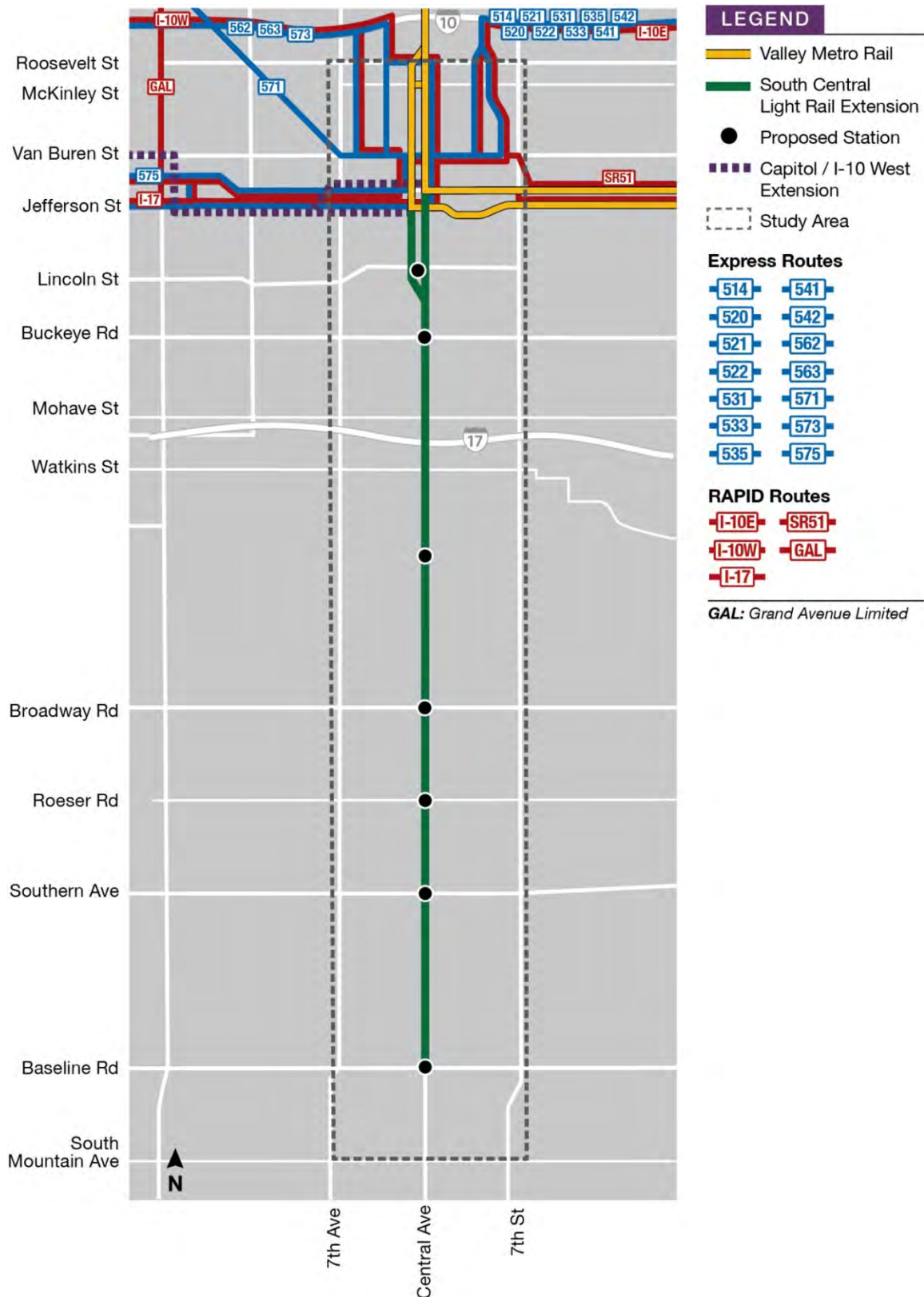


TABLE 2-8: BUILD ALTERNATIVE TRANSIT NETWORK

Route	Weekday Headways/Frequencies ^a (minutes)	
	Peak	Off-peak
High-capacity Transit		
Light rail	12	12
South Central Light Rail Extension	12	12
Local Buses		
Route 0 – Central Ave	20	30
Route 1 – Washington St/Jefferson St	30	30
Route 3 – Van Buren St	10	10
Route 7 – 7th St	20	30
Route 8 – 7th Ave	30	30
Route 10 – Roosevelt St	30	30
Route 13 – Buckeye Rd	30	35
Route 45 – Broadway Rd	15	30
Route 52 – Roeser Rd	30	30
Route 61 – Southern Ave	15	30
Route 77 – Baseline Rd	30	30
Route 77B – Baseline Rd	30	30
Circulator Buses		
Phoenix Business Circulator DASH	12	12
City of Phoenix RAPID		
I-10 West	10–20	None
I-10 East	10–20	None
SR 51	10–20	None
I-17	10–20	None
Arizona State University (ASU) Shuttles		
ASU Tempe to Phoenix CDB	60	60
ASU Tempe to West Campus	30	30
Express Buses		
Route 514 – Scottsdale/Fountain Hills	90	None
Route 520 – Tempe Express	90	None
Route 521 – Tempe Express	45	None
Route 522 – Tempe Express	45	None
Route 531– Mesa/Gilbert Express	30	None
Route 533 – Mesa Express	30	None
Route 535 – Northeast Mesa Express	36	None
Route 541 – Chandler Express	45	None
Route 542 – Chandler Express	45	None
Route 562 – Goodyear Express	45	None
Route 563 – Avondale/Buckeye Express	45	None

Route	Weekday Headways/Frequencies ^a (minutes)	
	Peak	Off-peak
Route 571 – Surprise	45	None
Route 573 – Northwest Valley Express	45	None
Route 575 – Northwest Valley Express	60	None
Grand Avenue Limited	90	None

Notes: I-10 = Interstate 10, I-17 = Interstate 17, SR = State Route

^a Headway means frequency of service

The main differences in transit service between the No-Build and Build Alternatives include:

- Addition of the South Central Light Rail Extension Project.
- Elimination of the Central South Mountain East and West RAPID routes because of duplicative service with the new light rail extension.
- Addition of Route 77B to supplement the existing Route 77 service. Both Routes 77 and 77B would operate to and from the South Central Extension end-of-line station at Baseline Road/Central Avenue to existing park-and-ride facilities at 27th Avenue/Baseline Road and 24th Street/Western Canal. Like Route 77, Route 77B would have 30-minute peak/off-peak headways, which would improve total headways between the park-and-rides and the light rail end-of-line station to 15-minute peak/off-peak headways.
- Decrease in headways for Route 0 (Central Avenue) from 10 minutes/20 minutes (peak/off-peak) for the No-Build Alternative to 20 minutes/30 minutes (peak/off-peak) for the Build Alternative.

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

Because it is anticipated that federal funds will be available for the South Central Light Rail Extension, NEPA requires evaluation of the proposed Build Alternative'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 Build Alternative'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 with those expected to occur as a result of construction and operation of the South Central Light Rail Extension (the Build Alternative). Each of the impact evaluation sections of the EA uses data and information from 2015, the existing conditions at the time of the EA writing, as the baseline from which to analyze impacts of the Build Alternative. The Build and No-Build Alternatives use the year 2035, the end date of the current RTP, as the future baseline for measuring environmental impacts against current conditions. Throughout the EA, the terms 2015 conditions, Build Alternative and No-Build Alternative will be used to represent these analysis periods (see Chapter 2.0 for definitions of the No-Build and Build Alternatives).

The environmental features analyzed were:

- | | |
|---|--|
| 3.1 Land Acquisition and Relocation | 3.12 Visual and Aesthetics |
| 3.2 Existing Land Use | 3.13 Community Impacts |
| 3.3 Consistency with Local Plans | 3.14 Environmental Justice |
| 3.4 Economic Effects | 3.15 Hazardous Materials |
| 3.5 Growth and Growth-induced Impacts | 3.16 Safety and Security Measures |
| 3.6 Traffic/Parking/Pedestrians/
Bicycles/Freight Routes/Transit | 3.17 Wetlands, Navigable Waters and
Floodplains |
| 3.7 Air Quality and Greenhouse Gases | 3.18 Water Quality |
| 3.8 Noise and Vibration | 3.19 Ecologically Sensitive Areas/
Threatened and Endangered
Species |
| 3.9 Energy Requirements and Potential
for Conservation | 3.20 Construction |
| 3.10 Historical and Archaeological Properties | 3.21 Cumulative Impacts |
| 3.11 Section 4(f) and Section 6(f) Evaluation | |

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

- Farmlands
- Geology/Soils/Seismicity
- Coastal Zones

Based on the technical analysis conducted, the proposed Build Alternative would 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) and Section 6(f) Resources
- Historic Properties
- Community Disruption (Long-term)
- Safety and Security
- Ecologically Sensitive Areas/
Threatened and Endangered Species
- Cumulative Impacts

Where potential adverse impacts have been identified minimization and mitigation measures are proposed. With the implementation of these measures, the impacts would not be adverse. However, impacts on archeological resources would be adverse. A Memorandum of Agreement (MOA) with the State Historic Preservation Officer (SHPO) will be prepared to resolve adverse effects on these resources. Other consulting parties may be invited to concur in the MOA.

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 this 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

This section summarizes the potential land acquisition impacts of the Build Alternative based on conceptual engineering plans presented in Appendix A of this EA. As the Build Alternative design becomes further refined, the extent of property acquisitions and displacements or relocations would also be subject to refinement. This includes the extent of the overall impact in terms of a full property impact compared with a location where a partial impact is anticipated (for example, conversion of an area of an existing parking lot to a light rail use). Existing land uses south of Downtown Phoenix adjacent to and in the vicinity of the proposed light rail alignment are primarily urban and include a mix of light industrial, commercial, public uses and residential. 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 could result in property acquisition to accommodate the planned 2035 roadway and transit improvements described in Section 2.2.1. Property acquisitions that result in relocation or displacement as a result of these planned roadway and transit improvements would be subject to separate environmental and permitting requirements associated with those individual acquisitions.

3.1.3 Build Alternative

Based on review of the Build Alternative area and the footprint necessary to accommodate the new light rail track, stations and park-and-rides, the Build Alternative would require the acquisition of 126 parcels. Of these, 121 would be partial acquisitions and five would be full acquisitions. These parcels include one building relocation and two possible building physical alterations and consist of a total of 330,434 sq ft. of property. Traction power substation (TPSS) and signal house locations would require the acquisition of five to six parcels, depending on the sites selected. One parcel would be a full acquisition and require a business relocation, while the remaining would be partial acquisitions. In total, these parcels consist of 35,911 sq ft. All these properties include a mix of land uses such as vacant lots, active commercial businesses, industrial complexes and some residential property.

3.1.3.1 Track, Stations, and Roadway Widening

The proposed light rail track and eight stations for the Build Alternative would potentially require full acquisition of one commercial parcel that includes the removal of one commercial building and partial acquisition of an additional 121 parcels, for a total of approximately 177,635 sq ft., or 4.1 acres. Land uses of the partial acquisition parcels include 3 residential, 94 commercial, 3 industrial, 9 public and 12 vacant.

The building to be completely removed would require relocation of a business (liquor store). It is not anticipated that the relocation of this business would be detrimental to the business or the community. There is available land in the study area for the business to relocate and, if demand for the type of service provided by the business remains, activity should continue at the new location, especially when it is reasonably near the existing location. Only two additional buildings (industrial and commercial) would be affected by partial ROW acquisitions. As the Build Alternative design progresses and property owner negotiations take place, it will be determined whether the buildings would need to be permanently removed or could be physically altered and remain in place. In conceptual design, physical alteration, such as cutting off the front of a building and refacing it, is possible, and therefore these are considered partial takes. If the buildings would need to be permanently removed, these acquisitions would be considered full property takes. No other property acquisitions would require relocations. The 121 parcels that would require partial takes account for approximately 169,931 sq ft. Of this amount, 76 percent is commercial property, 15 percent is vacant, 5 percent is public, 3 percent is residential and 1 percent is industrial. The one parcel that would require a full take accounts for approximately 7,804 sq ft. Of this amount, 100 percent is commercial property. Table 3-1 lists the potential land acquisition needs at this stage of the design process.

No acquisitions would be needed for the additional loop at McKinley Street or the OMC expansion.

TABLE 3-1: TRACK, STATIONS AND ROADWAY RIGHT-OF-WAY NEEDS

Parcel Number	Parcel Address	Site Location ^a	Land Use (General Plan)	Building(s) Affected (Yes/No)	Acquisition Impact	Parcel Size (sq ft.)	ROW Required (sq ft.)	Percentage of Total
30041100E	1 W Baseline Rd	Baseline Rd	Commercial	No	Partial	94,495	201	0.2
11225094	10 E Buckeye Rd	Buckeye Rd	Commercial	No	Partial	7,415	779	10.5
11224114	1004 S Central Ave	Central Ave	Industrial	No	Partial	8,628	55	0.6
11225086	1005 S Central Ave	Central Ave	Residential	No	Partial	7,415	117	1.6
11225088	1009 S Central Ave	Central Ave	Residential	No	Partial	7,040	232	3.3
11225090	1013 S Central Ave	Central Ave	Vacant	No	Partial	7,415	723	9.8
11225092	1017 S Central Ave	Central Ave	Vacant	No	Partial	7,415	1,107	14.9
11225096	1025 S Central Ave	Central Ave	Commercial	No	Partial	7,415	556	7.5
11225098	1027 S Central Ave	Central Ave	Commercial	No	Partial	4,987	240	4.8
11234016A	111 E Buckeye Rd	Buckeye Rd	Commercial	No	Partial	654,141	9,648	1.5
11234017A	1111 S Central Ave	Central Ave	Vacant	No	Partial	35,079	2,640	7.5
11224164B	1112 S Central Ave	Central Ave	Commercial	No	Partial	7,580	216	2.8
11224163D	1114 S Central Ave	Central Ave	Commercial	No	Partial	8,654	447	5.2
11242047A	115 E Watkins St	Watkins St	Commercial	No	Partial	77,621	149	0.2
11235025	1302 S Central Ave	Central Ave	Commercial	No	Partial	7,360	120	1.6
11234018D	1315 S Central Ave	Central Ave	Commercial	No	Partial	104,135	903	0.9
11334017	150 E Roeser Rd	Roeser Rd	Public	No	Partial	212,522	15	0.0
11238050	1524 S Central Ave	Central Ave	Public	No	Partial	11,010	551	5.0
11238077	1600 S Central Ave	Central Ave	Commercial	No	Partial	94,580	3,178	3.4
11239074	1701 S Central Ave	Central Ave	Commercial	No	Partial	2,760	220	8.0
11238065	1706 S Central Ave	Central Ave	Commercial	No	Partial	10,751	301	2.8
11239076	1707 S Central Ave	Central Ave	Commercial	No	Partial	6,000	17	0.3
11238064	1712 S Central Ave	Central Ave	Commercial	No	Partial	10,751	251	2.3
11238063	1716 S Central Ave	Central Ave	Commercial	No	Partial	9,225	169	1.8
11238062	1720 S Central Ave	Central Ave	Commercial	No	Partial	9,225	176	1.9
11238061	1722 S Central Ave	Central Ave	Commercial	No	Partial	9,225	200	2.2

Parcel Number	Parcel Address	Site Location ^a	Land Use (General Plan)	Building(s) Affected (Yes/No)	Acquisition Impact	Parcel Size (sq ft.)	ROW Required (sq ft.)	Percentage of Total
11238066	1801 S 1st Ave	1st Ave	Commercial	No	Partial	59,875	2,813	4.7
11242001D	1831 S Central Ave	Central Ave	Industrial	Yes	Partial	23,035	2,051	8.9
11242002A	1835 S Central Ave	Central Ave	Vacant	No	Partial	33,572	18,243	54.3
11416011G	20 E Baseline Rd	Baseline Rd	Commercial	No	Partial	28,576	1,367	4.8
11243029B	2025 S 1st Ave	1st Ave	Commercial	No	Partial	16,201	5,590	34.5
11243029C	2029 S 1st Ave	1st Ave	Vacant	No	Partial	997	137	13.7
11243035A	2032 S Central Ave	Central Ave	Commercial	No	Partial	16,025	6,285	39.2
11242005C	2125 S Central Ave	Central Ave	Commercial	Yes	Partial	46,665	11,656	25.0
11243089	2202 S Central Ave	Central Ave	Commercial	No	Partial	255,602	15,945	6.2
11243041A	2254 S Central Ave	Central Ave	Commercial	No	Partial	82,368	421	0.5
11309001	24 E Pioneer St	Pioneer St	Industrial	No	Partial	35,662	211	0.6
11416010C	26 E Baseline Rd	Baseline Rd	Commercial	No	Partial	212,125	1,973	0.9
11414001A	29 W Fremont Rd	Fremont Rd	Commercial	No	Partial	37,810	1,089	2.9
11309007B	3225 S Central Ave	Central Ave	Commercial	No	Partial	17,033	486	2.9
11309008	3333 S Central Ave	Central Ave	Commercial	No	Partial	23,970	1,227	5.1
11303081G	3402 S Central Ave	Central Ave	Commercial	No	Partial	31,755	1,705	5.4
11303083	3404 S Central Ave	Central Ave	Commercial	No	Partial	30,056	1,615	5.4
11313004	4201 S Central Ave	Central Ave	Commercial	No	Partial	18,558	1,763	9.5
11313003	4201 S Central Ave	Central Ave	Commercial	No	Partial	12,711	1,715	9.2
11313085F	4221 S Central Ave	Central Ave	Commercial	No	Partial	99,228	7,674	7.7
11313085H	4245 S Central Ave	Central Ave	Commercial	No	Partial	11,807	3,059	25.9
11333001A	4401 S Central Ave	Central Ave	Public	No	Partial	4,238	902	21.3
11333002	4409 S Central Ave	Central Ave	Public	No	Partial	11,400	1,725	15.1
11333006A	4409 S Central Ave	Central Ave	Public	No	Partial	29,683	1,737	5.9
11238049	49 W Pima St	Pima St	Commercial	No	Partial	81,436	111	0.1
11309082A	5 E Victory St	Victory St	Commercial	No	Partial	35,469	893	2.5
11331012	5050 S Central Ave	Central Ave	Commercial	No	Partial	6,950	31	0.5

Parcel Number	Parcel Address	Site Location ^a	Land Use (General Plan)	Building(s) Affected (Yes/No)	Acquisition Impact	Parcel Size (sq ft.)	ROW Required (sq ft.)	Percentage of Total
11341136A	5202 S Central Ave	Central Ave	Commercial	No	Partial	8,560	818	9.6
11341135A	5202 S Central Ave	Central Ave	Commercial	No	Partial	9,536	346	3.6
11341137	5202 S Central Ave	Central Ave	Commercial	No	Partial	6,835	287	4.2
11341142	5203 S 1st Ave	1st Ave	Commercial	No	Partial	6,588	391	5.9
11342032	5207 S Central Ave	Central Ave	Commercial	No	Partial	11,631	290	2.5
11341139A	5220 S Central Ave	Central Ave	Commercial	No	Partial	20,332	1,246	6.1
11342047L	5233 S Central Ave	Central Ave	Commercial	No	Partial	99,840	675	0.7
11341141	5236 S Central Ave	Central Ave	Commercial	No	Partial	6,600	401	6.1
11342034B	5239 S Central Ave	Central Ave	Commercial	No	Partial	16,204	347	2.1
11341143	5240 S Central Ave	Central Ave	Commercial	No	Partial	6,588	355	5.4
11342035	5246 S 3rd St	3rd St	Commercial	No	Partial	9,801	129	1.3
11341144	5250 S Central Ave	Central Ave	Commercial	No	Partial	6,588	280	4.3
11342043	5255 S Central Ave	Central Ave	Commercial	No	Partial	74,444	346	0.5
11341029	5400 S Central Ave	Central Ave	Commercial	No	Partial	6,760	60	0.9
11342049A	5403 S Central Ave	Central Ave	Commercial	No	Partial	97,070	127	0.1
11342049B	5409 S Central Ave	Central Ave	Commercial	No	Partial	4,356	69	1.6
11342041R	5415 S Central Ave	Central Ave	Vacant	No	Partial	22,825	3	0.0
11340004A	5818 S Central Ave	Central Ave	Commercial	No	Partial	10,722	77	0.7
11340002A	5834 S Central Ave	Central Ave	Commercial	No	Partial	25,870	364	1.4
11340001A	5850 S Central Ave	Central Ave	Commercial	No	Partial	12,823	892	7.0
11402077A	6005 S Central Ave	Central Ave	Commercial	No	Partial	39,560	793	2.0
11402078	6021 S Central Ave	Central Ave	Commercial	No	Partial	112,302	878	0.8
11402037E	6049 S Central Ave	Central Ave	Vacant	No	Partial	4,792	392	8.2
11403002E	6060 S Central Ave	Central Ave	Commercial	No	Partial	343,091	1,093	0.3
11223025	615 S 1st Ave	1st Ave	Vacant	No	Partial	6,245	87	1.4
11403120A	6200 S Central Ave	Central Ave	Public	No	Partial	114,911	1,212	1.1
11402037F	6207 S Central Ave	Central Ave	Commercial	No	Partial	22,172	1,565	7.1

Parcel Number	Parcel Address	Site Location ^a	Land Use (General Plan)	Building(s) Affected (Yes/No)	Acquisition Impact	Parcel Size (sq ft.)	ROW Required (sq ft.)	Percentage of Total
11223027	621 S 1st Ave	1st Ave	Vacant	No	Partial	6,245	336	5.4
11402052	6217 S Central Ave	Central Ave	Commercial	No	Partial	12,125	82	0.7
11402053	6219 S Central Ave	Central Ave	Commercial	No	Partial	8,089	15	0.2
11403120C	6240 S Central Ave	Central Ave	Commercial	No	Partial	39,021	1,815	4.7
11402059	6249 S Central Ave	Central Ave	Commercial	No	Partial	8,098	102	1.3
11406049	6402 S Central Ave	Central Ave	Commercial	No	Partial	11,456	325	2.8
11406062	6410 S Central Ave	Central Ave	Commercial	No	Partial	8,233	81	1.0
11406058	6412 S Central Ave	Central Ave	Commercial	No	Partial	8,276	26	0.3
11407102	6413 S Central Ave	Central Ave	Public	No	Partial	169,928	1,879	1.1
11407002	6427 S Central Ave	Central Ave	Commercial	No	Partial	7,855	681	8.7
11407015B	6437 S Central Ave	Central Ave	Commercial	No	Partial	4,078	334	8.2
11406043M	6600 S Central Ave	Central Ave	Vacant	No	Partial	117,101	288	0.3
11406063B	6622 S Central Ave	Central Ave	Commercial	No	Partial	14,026	558	4.0
11406063J	6650 S Central Ave	Central Ave	Commercial	No	Partial	26,220	1,353	5.2
11411019	6808 S Central Ave	Central Ave	Vacant	No	Partial	68,520	1,412	2.1
11411020C	6810 S Central Ave	Central Ave	Commercial	No	Partial	76,807	888	1.2
11411004	6826 S Central Ave	Central Ave	Commercial	No	Partial	14,113	360	2.6
11411005	6834 S Central Ave	Central Ave	Commercial	No	Partial	13,206	292	2.2
11411036	6840 S Central Ave	Central Ave	Commercial	No	Partial	25,224	80	0.3
11407001	7 E St Catherine Ave	St Catherine Ave	Commercial	No	Partial	7,928	228	2.9
11411021D	7004 S Central Ave	Central Ave	Commercial	No	Partial	29,490	5	0.0
11411022	7014 S Central Ave	Central Ave	Commercial	No	Partial	75,228	487	0.6
11410015	7027 S Central Ave	Central Ave	Commercial	No	Partial	37,200	10	0.0
11410018	7035 S Central Ave	Central Ave	Commercial	No	Partial	37,191	757	2.0
11414002B	7216 S Central Ave	Central Ave	Vacant	No	Partial ^b	27,269	569	2.1
11223058	722 S Central Ave	Central Ave	Commercial	Yes	Full	7,804	7,804	100.0
11416002F	7227 S Central Ave	Central Ave	Commercial	No	Partial	382,186	84	0.0

Parcel Number	Parcel Address	Site Location ^a	Land Use (General Plan)	Building(s) Affected (Yes/No)	Acquisition Impact	Parcel Size (sq ft.)	ROW Required (sq ft.)	Percentage of Total
11414003	7236 S Central Ave	Central Ave	Commercial	No	Partial	106,853	2,402	2.2
11414004	7246 S Central Ave	Central Ave	Commercial	No	Partial	35,632	1,872	5.3
11414012B	7252 S Central Ave	Central Ave	Residential	No	Partial	81,501	4,567	5.6
11414006	7424 S Central Ave	Central Ave	Commercial	No	Partial	9,627	2,941	30.5
11414007B	7428 S Central Ave	Central Ave	Commercial	No	Partial	20,604	1,810	8.8
11414008C	7436 S Central Ave	Central Ave	Commercial	No	Partial	21,432	5,137	24.0
11414005C	7444 S Central Ave	Central Ave	Commercial	No	Partial	20,212	4,956	24.5
30042001	7601 S Central Ave	Central Ave	Commercial	No	Partial	19,297	979	5.1
30041100C	7602 S Central Ave	Central Ave	Commercial	No	Partial	12,479	223	1.8
30042014	7617 S Central Ave	Central Ave	Commercial	No	Partial	10,890	55	0.5
11224062C	901 S 1st Ave	1st Ave	Public	No	Partial	74,683	13	0.0
11223052A	Address not available	1st Ave	Commercial	No	Partial	11,581	78	0.7
11224062B	Address not available	Central Ave	Public	No	Partial	23,622	647	2.7
11303081E	Address not available	Central Ave	Commercial	No	Partial	14,810	1,120	7.6
11414012C	Address not available	Central Ave	Commercial	No	Partial	12,151	826	6.8
Total (122 parcels):						5,510,988	177,635	3.2

Note: ROW = right-of-way

^a Property acquisition locations are presented in the conceptual engineering plans in Appendix A.

^b Note that the ROW required for tracks, stations and roadway widening only requires a partial acquisition. However, as noted in Table 3-3, there are additional ROW needs for the park-and-ride facility at this location, resulting in a combined full take of this property.

3.1.3.2 Traction Power Substations and Signal Houses

Six candidate locations have been identified as possible combined TPSS/signal house locations and are shown in the conceptual engineering plans in Appendix A. The TPSSs/signal houses would be spaced approximately 1 mile apart to provide electrical power for light rail vehicles and special trackwork. All six of the candidate sites would need to include a signal house, which is used to electronically activate the special track switches, allowing the light rail vehicle to switch from one track to another.

An additional signal house, not associated with a TPSS, has been identified in the Downtown area at CityScape. This signal house would be within the existing parking structure at CityScape, which is owned by the City of Phoenix. Additional information about TPSS and signal house facilities is in Chapter 2.0, Table 2-6.

All six TPSS and seven signal house sites are being environmentally cleared for this EA. However, only five TPSS sites and six signal house sites would be needed for the Build Alternative. The actual sites selected for implementation would be determined during the later engineering phases as the design becomes more refined and more design information is available. At that time, the actual power load requirements can be calculated and the final locations for TPSSs can be determined. Each combined TPSS/signal house site would require approximately 5,000 sq ft. This total includes the TPSS/signal house structures and the site's driveway and access area.

The signal house without the TPSS structure would require about 4,500 sq ft. of ROW. As shown in Table 3-2, the eight parcels needed for TPSS and signal house structures account for approximately 35,911 sq ft. Of this amount, 74 percent is commercial property and 26 percent is vacant. One commercial parcel could require full acquisition, and seven parcels could require partial acquisitions, including four commercial and three vacant parcels. None of the land acquisitions would require the demolition of buildings or the relocation of businesses or residences.

3.1.3.3 Park-and-Rides

A new park-and-ride lot would be built to accommodate 70 to 80 vehicles near Central Avenue and Broadway Road. The lot would be built on property owned by the City of Phoenix located immediately west of and adjacent to the Ed Pastor Transit Center (see Figure 2-6 in Chapter 2.0).

Parking for the end-of-line station at Baseline Road/Central Avenue would be provided by a new park-and-ride lot. The new park-and-ride lot near the Baseline Road/Central Avenue station would accommodate approximately 365 parking spaces and would be on the western side of Central Avenue between the northern end of the station and Fremont Road. Property acquisition for the new park-and-ride facility on Fremont Road is provided in Table 3-3. Six parcels totaling approximately 151,145 sq ft. would be needed. Of this amount, 53 percent is vacant property, 41 percent is commercial and 6 percent is residential. No buildings would be affected.

3.1.3.4 Temporary Construction Easements and Staging Areas

It would be necessary to obtain temporary construction easements (TCEs, areas needed on private property to access construction sites) to accommodate equipment and staging areas for materials during construction. Because of the Build Alternative's length, multiple sites would be identified for construction staging areas. The Contractor selected to build the Build Alternative would determine the specific locations, in coordination with Valley Metro and the City of Phoenix.

TCEs. TCEs for the Build Alternative would be acquired adjacent to the ROW where construction activities approach the limits of the ROW and where the construction itself would require additional construction beyond the limits of the ROW to provide an acceptable transition from 2015 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 use of TCEs is related to the repair of landscaping affected by removals of existing features or the construction of improvements within the ROW. In cases where the existing elevation differs from the elevation of the street improvements, a short retaining wall may be constructed at the ROW to protect private property. While the retaining wall would be within the ROW, some construction disturbance would be required beyond the ROW limits. Most TCEs for the Build Alternative would be used for approximately 6 to 9 months, depending on the Build Alternative's schedule and the requirements of the Contractor for each site.

The Build Alternative would require an approximately 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 would generally be needed only where roadways are widened, where sidewalks are relocated and where access driveways are reconstructed. The disturbed property within the TCEs would be restored upon construction completion.

Construction Staging Areas. Eight potential staging areas have been identified and environmentally cleared as part of this EA. 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 fabrication of construction materials (for example, on-site welding of rail strings). Temporary fencing would 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 or other publicly used parcels with no plans for other uses during the construction period. The priority would be to use City-owned parcels or publicly owned 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 pre-2015 conditions as needed. The City of Phoenix would require that the land have zoning appropriate for the use and that all applicable zoning regulations are applied. The City of Phoenix would require a special permit that may include special provisions to protect adjacent land uses if sensitive areas are identified.

Potential construction staging areas are identified in Table 3-4 and analyzed to the extent possible in the EA. At this extent, 32 parcels totaling approximately 2,160,811 sq ft. would be needed. Of this amount, 75 percent is public or other employment property, 16 percent is vacant and 9 percent is open space. Any changes to the Build Alternative's scope of work, including property acquisition and additional staging areas or other TCEs, would be subject to environmental review in accordance with NEPA and 23 CFR Part 771.129 and must be approved by FTA.

3.1.3.5 Traffic Mitigation on 7th Avenue and 7th Street

The analysis of impacts to traffic found that the Build Alternative would cause an increase in traffic delays at specific intersections along the nearest parallel major arterials, 7th Street and 7th Avenue. To reduce these delays to acceptable levels, mitigation measures were identified (see Section 3.6 for additional information). One of these mitigation measures, the addition of a right-turn lane heading southbound on 7th Avenue north of I-17, would require a strip of new ROW. One parcel would be affected, as shown in Table 3-5 and Appendix A.

3.1.4 Mitigation

In summary, the Build Alternative would require the acquisition of 126 parcels (5 full parcel acquisitions and 121 partial) for the guideway, stations, roadway widening, TPSS/signal houses and park-and-ride facilities. In total, full acquisitions would account for approximately 111,976 sq ft. of ROW and partial acquisitions would account for 254,369 sq ft. of ROW (includes mitigation on 7th Avenue and I-17). 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), the Uniform Relocation Act Amendments of 1987 (Public Law 100-17). Private property owners would be compensated at fair market value for land acquired for Build Alternative ROW. Landowners required to move to a new business location may be eligible for relocation benefits. These payments may include a housing supplement, moving costs, reestablishment costs, incidental expenses and closing costs. Renters may also be eligible for relocation benefits.

The Uniform Relocation Assistance and Real Property Acquisition Policies Act and its amendments provide protection and assistance for residents and businesses affected by the acquisition and demolition of real property during construction of federally funded projects. All partial and full acquisitions of properties would conform to provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended.

The Uniform Relocation Assistance and Real Property Acquisition Policies Act require that relocation services and payments be made available to eligible residents and property owners. An offer of just compensation, which would not be less than the approved appraisal value of the property, would be made to each property owner. Equivalent, safe and sanitary replacement housing or business facility, which is within the displaced person or business owner's financial means, would be made available before the person or business owner is displaced. Expenses for moving personal property to the relocation site, escrow fees, surveys, appraisals and other closing costs on a new home or business site would also be eligible for payment with certain limits.

TABLE 3-2: TRACTION POWER SUBSTATION AND SIGNAL HOUSE RIGHT-OF-WAY NEEDS

Parcel Number	Parcel Address	Plan Sheet ^a	Land Use (General Plan)	Building(s) Affected (Yes/No)	Acquisition Impact	Parcel Size (sq ft.)	ROW Required (sq ft.)	% of Total
11222107B	1 W Washington St	3	Commercial	No	N/A	374,1400	0 ^b	0.0
11223058	722 S Central Ave	6	Commercial	No	Partial	7,804	1,868 ^c	23.9
11238050	1524 S Central Ave	7	Commercial	Yes	Full	14,352	14,352	100.0
11311094 ^d 11311095	3705 S Central Ave 3709 S Central Ave	12	Vacant	No	Partial	12,350	4,369	35.8
11342079A	10 E Sunland Ave	16	Commercial	No	Partial	18,569	5,100	27.5
11410014A	7009 S Central Ave	19	Vacant	No	Partial	18,199	5,105	28.1
11416002F	7227 S Central Ave	19	Commercial	No	Partial	379,911	5,117	1.3
Total (8 parcels)						4,192,585	35,911	0.9

Notes: N/A = not applicable, ROW = right-of-way, sq ft. = square feet

^a Plan sheet refers to the conceptual engineering plans in Appendix A.

^b This signal house would be within the CityScape development, which is owned by the City of Phoenix.

^c The rest of the property needed for this traction power substation would be in existing City of Phoenix ROW.

^d This traction power substation site would be sited on multiple abutting parcels.

TABLE 3-3: PARK-AND-RIDE RIGHT-OF-WAY NEEDS

Parcel Number	Parcel Address	Plan Sheet ^a	Land Use (General Plan)	Building(s) Impacted (Yes/No)	Acquisition Impact	Parcel Size (sq ft.)	ROW Required (sq ft.)	% of Total
11414015D	35 W Fremont Rd	19	Residential ^b	No	Full	9,562	9,562	100.0
11414015C	45 W Fremont Rd	19	Vacant	No	Full	9,562	9,562	100.0
11414002B	7216 S Central Ave ^c	19	Vacant	No	Full	27,269	26,700	97.9
11414003	7236 S Central Ave ^c	19	Commercial	No	Partial	106,853	46,057	43.1
11414004	7246 S Central Ave ^c	19	Commercial	No	Partial	35,632	15,268	42.9
11414015A	Address not available	19	Vacant	No	Full	43,996	43,996	100.0
Total (6 parcels)						223,312	151,145	67.7

Notes: ROW = right-of-way, sq ft. = square feet

^a Plan sheet refers to the conceptual engineering plans in Appendix A.

^b Even though the General Plan land use sector is residential, the property currently has no buildings (it is vacant).

^c The ROW needs for this parcel identified this table are above and beyond the ROW needs identified in Table 3-1. These parcels appear twice, once in Table 3-1 and again here (ROW is for different purpose and a different amount).

TABLE 3-4: CONSTRUCTION STAGING AREA RIGHT-OF-WAY NEEDS

Parcel Number	Parcel Address	Plan Sheet ^a	Land Use (General Plan)	Building(s) Affected (Yes/No)	Temporary Impact	Parcel Size (sq ft.)	ROW Required (sq ft.) ^b	% of Total
11223939A ^c 11223937A 11223039E 11223936A 11223938A 11223039D	502 S 2nd Ave 502 S 2nd Ave N/A 502 S 2nd Ave 502 S 2nd Ave 610 S 1st Ave	5	Public and Other Employment ^d	No	Full	89,371	89,371	100.0
11223026B ^c 11223018 11223023 11223020 11223024 11223016 11223022 11223027 11223026A 11223025	N/A N/A 615 S 1st Ave N/A N/A 602 S Central Ave N/A 621 S 1st Ave 618 S Central Ave 615 S 1st Ave	5	Vacant	No	Full	67,082	67,082	100.0
11224008B	810 S Central Ave	6	Vacant	No	Full	25,517	25,517	100.0
11234017A	1111 S Central Ave	6	Vacant	No	Full	35,030	35,030	100.0
11301008D ^c 11301005B 11301005C	3205 S 7th Ave N/A N/A	10	Public and Other Employment	No	Full	1,668,838	1,668,838	100.0
11333006A ^c 11333002 11333001A 11333007D 11333008B 11333007E 11333009 11333007B 11333010B	4409 S Central Ave 4409 S Central Ave 4401 S Central Ave 17 E Broadway Rd 37 E Broadway Rd 27 E Broadway Rd 32 E Corona Ave 22 E Corona Ave 47 E Broadway Rd	13	Vacant	No	Full	167,351	0 ^e	100.0

Parcel Number	Parcel Address	Plan Sheet ^a	Land Use (General Plan)	Building(s) Affected (Yes/No)	Temporary Impact	Parcel Size (sq ft.)	ROW Required (sq ft.) ^b	% of Total
11334017	150 E Roeser Rd	15	Open Space	No	Full	207,360	207,360	100.0
11411019	6808 S Central Ave	18	Vacant	No	Full	67,613	67,613	100.0
Total (32 parcels)						2,328,162	2,160,811	92.8

Notes: N/A = not applicable, ROW = right-of-way, sq ft. = square feet

^a Plan sheet refers to the conceptual engineering plans in Appendix A.

^b At some construction staging areas, the entire parcel would likely not be needed. However, for this assessment, it is assumed the entire parcel would be required.

^c This property is owned by the City of Phoenix.

^d The Public and Other Employment land use sector is used by the Maricopa Association of Governments to describe land uses such as hospitality, educational, religious, medical or nursing homes, cemeteries, military facilities and any other city, state or federally owned land.

^e This construction staging area would be sited on multiple abutting parcels.

TABLE 3-5: 7TH AVENUE AND INTERSTATE 17 RIGHT-OF-WAY NEEDS

Parcel Number	Parcel Address	Plan Sheet ^a	Land Use (General Plan)	Building(s) Impacted (Yes/No)	Acquisition Impact	Parcel Size (sq ft.)	ROW Required (sq ft.)	% of Total
10534109	Address not available	D	Industrial	No	Partial	302,442	1,654	0.5
Total (1 parcel)						302,442	1,654	0.5

Notes: ROW = right-of-way, sq ft. = square feet

^a Plan sheet refers to the conceptual engineering plans in Appendix A.

Since the Build Alternative would result in property acquisitions to accommodate the light rail alignment, negotiations regarding price and relocation area options with property owners would occur. Locations identified for TPSS and signal house sites have been selected to minimize adverse impacts to properties that are currently occupied.

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 pre-2015 conditions as needed.

In conclusion, the Build Alternative would have no adverse effect with the implementation of the mitigation measures identified above.

3.2 EXISTING LAND USE

3.2.1 Environmental Setting

This section summarizes the existing land use and associated conditions in Phoenix within one-half mile of the proposed Build Alternative alignment, adjacent to the additional loop along the existing light rail alignment at McKinley Street and adjacent to the OMC.

The Build Alternative corridor includes multiple land uses. Existing land uses at the northern terminus in Downtown Phoenix are primarily urban, including light industrial, public uses and transportation (parking lots). As the light rail alignment transitions south from Downtown, residential single-family housing becomes more prominent until reaching the Salt River. South of the Salt River, existing land uses are almost exclusively light industrial and distribution facilities, with small amounts of commercial uses adjacent to Central Avenue. Residential land uses again become more predominant south of Broadway Road adjacent to the proposed light rail alignment to Baseline Road.

Existing land uses adjacent to the additional loop at McKinley Street are primarily commercial, medical/nursing home, transportation (parking) and vacant uses. The existing land use of the OMC is public, with most surrounding land uses being industrial, transportation, vacant and open space. Table 3-6 provides a breakdown of land uses within one-half mile of the alignment and station areas, and Figures 3-1 and 3-2 show existing land uses in the study area.

**TABLE 3-6: LAND USE WITHIN ONE-HALF MILE
OF ALIGNMENT AND STATION AREAS**

Land Use Sector	Acres	% of Total Land Use
Commercial	296.14	10.47
Industrial	272.22	9.63
Multifamily residential	110.62	3.91
Multiple use	7.57	0.27
Office	49.06	1.73
Open space	246.34	8.71
Public and other employment ^a	434.79	15.37
Single-family residential	951.67	33.65
Transportation	182.58	6.46
Vacant	277.20	9.80
Total	2,828.18	100.00

Source: Maricopa Association of Governments (2012)

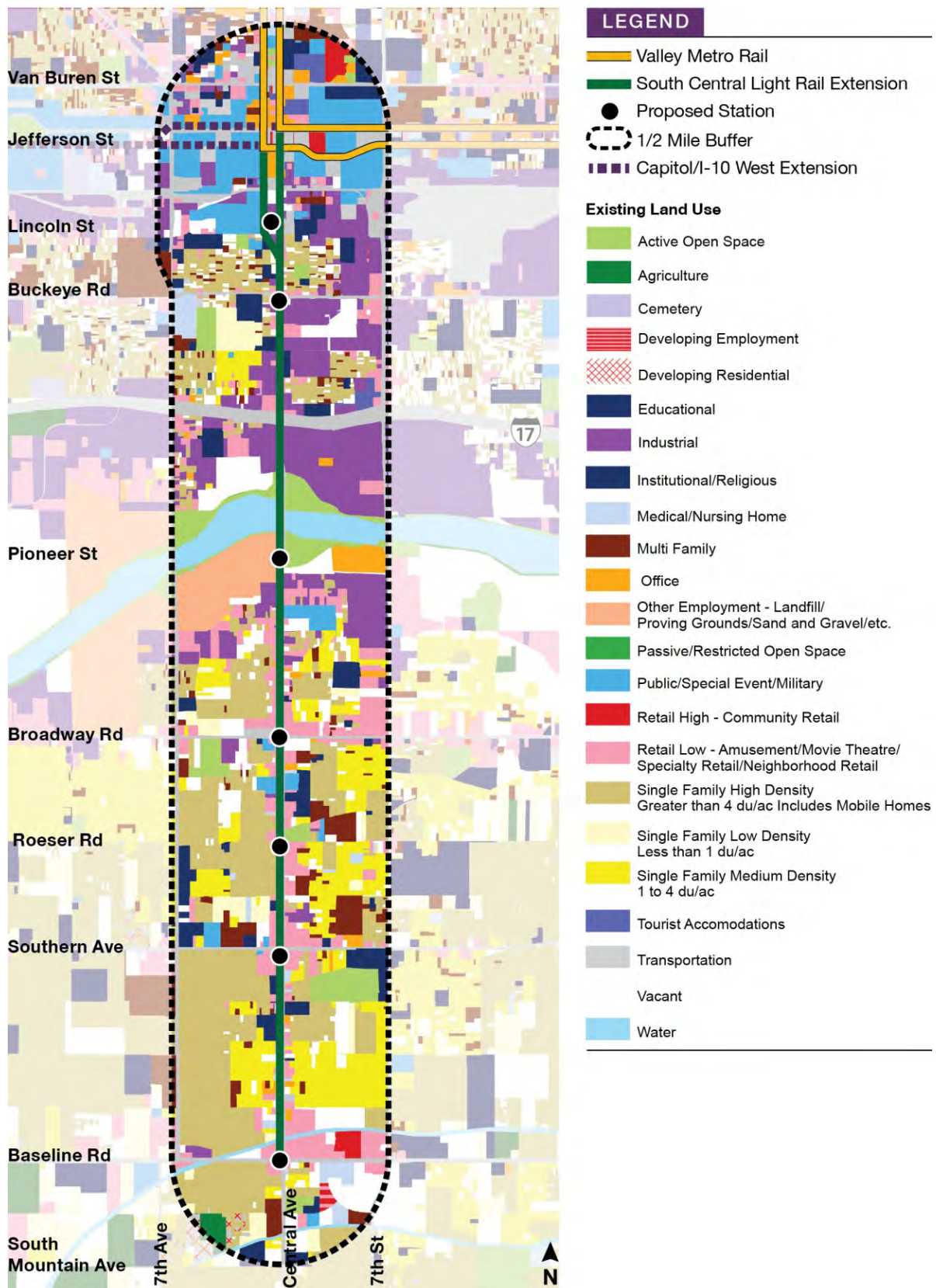
^a The public and other employment land use sector is used by the Maricopa Association of Governments to describe land uses such as hospitality, educational, religious, medical or nursing homes, cemeteries, military facilities, and any other city, state or federally owned land.

3.2.2 No-Build Alternative

The No-Build Alternative represents conditions in the corridor if the South Central Light Rail Extension is not built. In addition, the existing transit and roadway/highway system defined in the RTP and TIP would be implemented under the No-Build Alternative as discussed in Section 2.2.1.

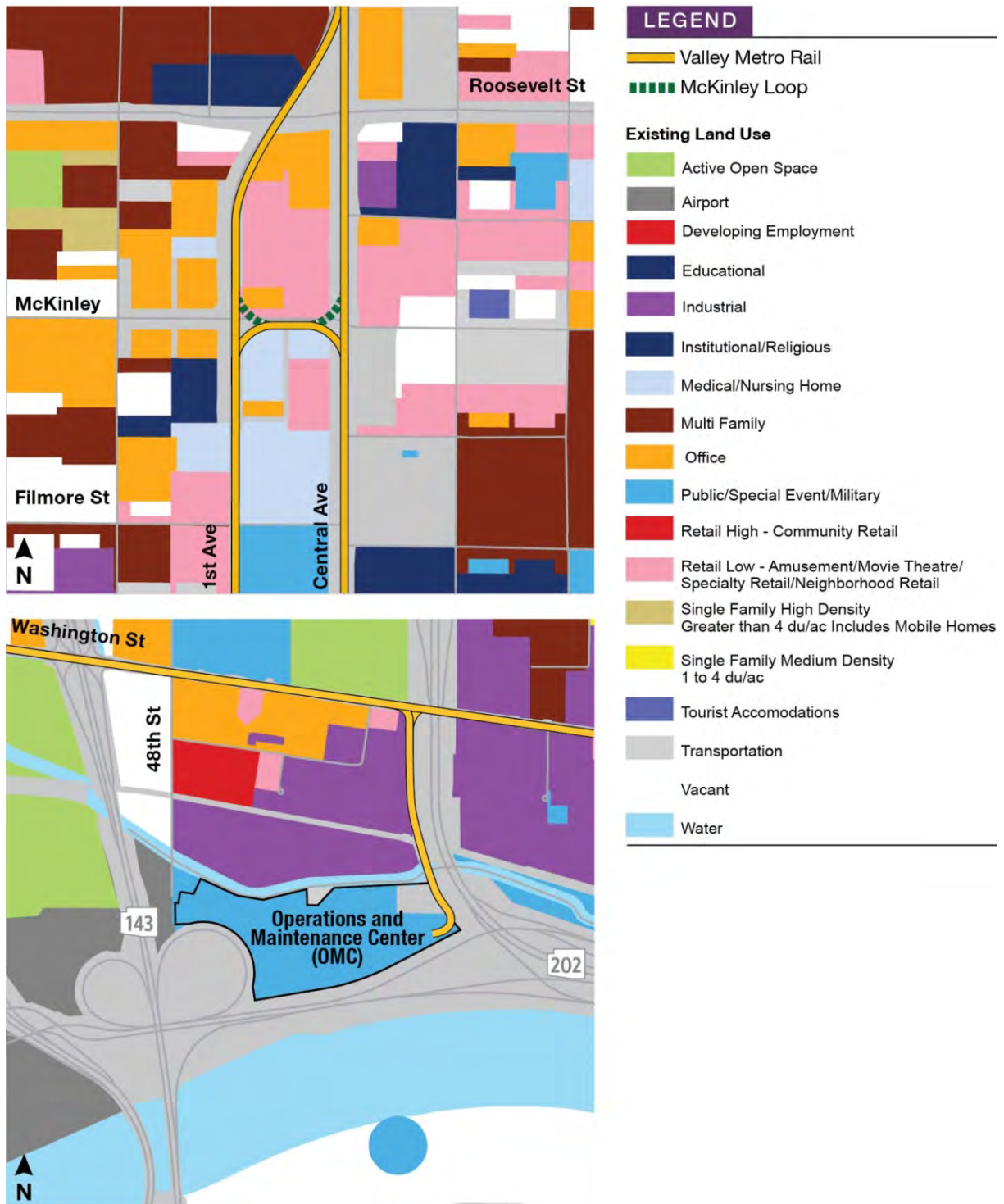
It is not anticipated that changes to land use would occur; however, the No-Build Alternative could result in property acquisition to accommodate the planned roadway and transit improvements as described in Section 2.2.1. Even so, existing land use patterns and trends would generally be maintained and the patterns and trends of land development and socioeconomic activity currently occurring in the corridor would continue, including a continued increase in development and redevelopment actions. Changes would occur through typical market forces and the implementation of various governmental plans for development and redevelopment. The area's general character is expected to remain relatively constant, with some infill occurring. Therefore, the No-Build Alternative would have no adverse impacts 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 3.21.

FIGURE 3-1: EXISTING LAND USE ALONG CENTRAL AVENUE



Source: Maricopa Association of Governments (2012)

**FIGURE 3-2: EXISTING LAND USE AT MCKINLEY STREET LOOP
AND OPERATIONS AND MAINTENANCE CENTER**



Source: Maricopa Association of Governments (2012)

3.2.3 Build Alternative

As described in Section 3.1 and detailed in Table 3-1, the Build Alternative is primarily located in existing City of Phoenix ROW and would require the partial acquisition of parcels for transportation use along most of the alignment, primarily near major intersections, stations and other light rail facilities.

Implementation of the Build Alternative would modify existing land uses only in those locations where full property acquisitions would be required. This would consist of five parcels that would be needed for trackwork, stations and a park-and-ride. This number could rise to six full property acquisitions, depending on the sites chosen for TPSSs. All of these sites would be converted from their existing land uses to a transportation land use, as described in Section 3.1.3.

Most of the properties for the track requiring land acquisition are slivers needed to widen the street ROW (see Table 3-1 for more detail). This partial property acquisition would not change the current land use of these parcels and would have minimal effects on existing parking and landscaping.

The track and stations would require the removal of one building and the possible alteration of two others through the land acquisition process. All of these buildings are commercial or industrial establishments. Six possible TPSSs and one possible signal house site consisting of eight parcels would be environmentally cleared in this EA, although only five TPSSs and one extra signal house would be needed to construct the Build Alternative. These five TPSSs, which could consist of between five and six parcels, would be converted to transportation uses, as discussed in Section 3.1.3.2 and Table 3-2. Lane widening along I-17 and 7th Avenue (Section 3.1.3.5 and Table 3-5) would require only a partial acquisition and would have no impact on the existing land use of the acquired property.

The trackwork at the additional loop at McKinley Street would not adversely affect the land uses in the area because the improvement would be contained completely within the existing City of Phoenix ROW.

The OMC improvements and expansion would not adversely affect land uses in the area. The new trackwork and facilities would be constructed on vacant land that is part of the OMC facility and would be used in the same manner as current operations. The land uses adjacent to these improvements are transportation and industrial.

The new park-and-ride lot near Central Avenue and Broadway Road would be built on property owned by the City of Phoenix west of and adjacent to the Ed Pastor Transit Center (see Figure 2-6 in Chapter 2.0). This property currently serves as a retention basin for the transit center and thus is already a transportation land use. The new park-and-ride lot near the Baseline Road/Central Avenue station proposed on the western side of Central Avenue between the northern end of the station and Fremont Road would also be converted to transportation use and would require six complete parcel takes totaling approximately 151,145 sq ft. Three of the parcels are vacant, one is residential and two are commercial.

Overall, the conversion of existing undeveloped land, or developed uses, is anticipated to progress in accordance with existing land use and comprehensive planning documents for the study area, as described in Section 3.3.

Ultimately, the Build Alternative is anticipated to positively influence land use within the study area, as further discussed in Sections 3.4 and 3.5 of this EA. Therefore, the Build Alternative would result in no adverse impacts related to existing land use.

3.2.4 Mitigation

No mitigation measures are needed because no adverse impact on existing land use would occur.

3.3 CONSISTENCY WITH LOCAL PLANS

3.3.1 Environmental Setting

This section discusses the consistency of the No-Build and Build Alternatives with the adopted land use and transportation plans of the City of Phoenix and regional governmental agencies. Table 3-7 summarizes the relevant adopted local plans. The City of Phoenix, MAG and Valley Metro have a record of implementing transit-supportive plans and policies to encourage transit investments. Many of these plans have been developed to encourage smart growth, transit-oriented development, sustainability and a balanced transportation system throughout Phoenix and the greater metropolitan region.

The City's planning documents and regulatory ordinances include objectives, goals and policies intended to promote land use development in the South Central corridor that is consistent with HCT 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.

3.3.2 No-Build Alternative

The No-Build Alternative represents conditions in 2035 if the South Central Light Rail Extension is not built and is defined as the existing transit and roadway/highway system plus programmed (committed) transportation improvement projects, as discussed in Section 2.2.1. The No-Build Alternative would not meet the stated goals and objectives for the community as outlined in the documents presented in Table 3-7 and discussed in Section 1.2 for the proposed Build Alternative. Therefore, the No-Build Alternative would not be consistent with existing local or regional plans for future transit facility expansion in the City of Phoenix.

TABLE 3-7: SUMMARY OF LOCAL PLANS

Plan	Lead Agency	Summary
2035 <i>Regional Transportation Plan</i> (2014)	MAG	Regional transportation plan that addresses multimodal transportation needs for the next 20 years. The plan provides a framework for highway, street, bike, transit, airport and freight improvements, and addressing demand management, intelligent transportation systems and safety.
<i>Sustainable Transportation and Land Use Integration Study</i> (2013)	MAG	Regional study focusing on the integration of land use and transportation planning to better implement successful HCT. The study recommends strategies for implementing higher density land uses and urban development that promotes transit use, especially near transit stations.
<i>Regional Transit Framework Study</i> (2010)	MAG	Regional study that identifies future transit needs and recommended specific improvements over the next 20 to 40 years. Through travel demand forecasting and socioeconomic analysis, the study also prioritizes the recommended transit improvements to optimize ridership potential.
<i>High Capacity Transit Study</i> (2003)	MAG	Regional study that identifies HCT corridors and alternatives, including commuter and light rail, in the Phoenix metropolitan area.
<i>Design Criteria Manual: Valley Metro Light Rail Transit Projects</i> (2014 Update)	Valley Metro	A set of general guidelines and specific criteria that guide the planning, design and construction of new regional light rail corridors and extensions.
<i>Transit Life Cycle Program</i> (2013 Update)	Valley Metro	Financial program that documents how regional public transportation funds are being used in the near term and long term.
<i>Phoenix General Plan</i> (PlanPHX) (2015)	City of Phoenix	A long-range planning document that guides future development, including housing, transportation, land use and public facilities, among other topics.
<i>Reinvent Phoenix</i> (in progress)	City of Phoenix	A local collaborative planning process to create and implement walkable communities along the current light rail starter line in Phoenix. The plan created six districts along the light rail line, each of which will have its own plan, goals and objectives for creating a transit-oriented district.
Complete Streets Ordinance	City of Phoenix	A City Ordinance that strives to make Phoenix more friendly to all modes of transportation, including transit investments, bicycle facilities and pedestrian walkways so that the City can be more livable and sustainable.
<i>City of Phoenix High Capacity Transit Corridor Study</i> (2009)	City of Phoenix	Local study that identified corridors in the city of Phoenix that meet criteria for HCT service. The study recommended options for service improvements, additional routes for HCT and potential future locations for park-and-ride facilities. The study provided input into the MAG Transit Framework Study.

Notes: HCT = high-capacity transit, MAG = Maricopa Association of Governments

3.3.3 **Build Alternative**

The Build Alternative is consistent with major plans and policies (Table 3-8) that emphasize improving the mobility of all residents by providing enhanced access, encouraging diverse urban lifestyles and improving the quality of life for everyone. The

Build Alternative would also provide a direct connection to the regional transit system and would promote denser, more urban neighborhoods in the corridor, which are all consistent with the goals outlined by the City of Phoenix in its various plans and policies.

TABLE 3-8: CONSISTENCY WITH LOCAL PLANS

Plan	Reason
<i>2035 Regional Transportation Plan (2014)</i>	Yes – The plan identified the South Central corridor as a future HCT corridor and identified a robust transit system as a “critical component of the regional transportation network.”
<i>Sustainable Transportation and Land Use Integration Study (2013)</i>	Yes – The study recommended the region “provide a high quality, productive transit system supported by compact walkable and transit-oriented places.”
<i>Regional Transit Framework Study (2010)</i>	Yes – The study identified the South Central corridor as needing new or expanded transit service.
<i>High Capacity Transit Study (2003)</i>	Yes – The study recommended future light rail or dedicated bus rapid transit along the South Central corridor.
<i>Design Criteria Manual: Valley Metro Light Rail Transit Projects (2014 Update)</i>	Yes – The Design Criteria Manual was established to guide the urban design of any type of light rail project in the region.
<i>Transit Life Cycle Program (2015 Update)</i>	Yes – The program identifies the South Central corridor as a future HCT corridor to meet transportation demand in 2040.
<i>Phoenix General Plan (PlanPHX) (2015)</i>	Yes – The 2015 General Plan identified the South Central corridor as a future HCT corridor. It also committed to the development of transit corridors, infill development and a comprehensive multimodal transportation system that includes transit as a key component.
<i>Reinvent Phoenix (in progress)</i>	Yes – The Reinvent Phoenix process will establish plans, policies and strategies for establishing transit-oriented development along all light rail stations in Phoenix.
<i>Complete Streets Ordinance</i>	Yes – The South Central corridor will make Central Avenue a multimodal street by providing HCT, improved bicycle lanes and better pedestrian amenities.
<i>City of Phoenix High Capacity Transit Corridor Study (2009)</i>	Yes – The South Central corridor was ranked in the upper tier of all corridors evaluated and recommended for inclusion in regional transit plans as an HCT corridor.

Note: HCT = high-capacity transit

3.3.4 Mitigation

No mitigation would be necessary to make the Build Alternative consistent with existing local and regional plans. The Build Alternative would result in beneficial impacts, and it is consistent with plans and policies of the City of Phoenix, other county and regional organizations and stakeholders. There would be no adverse impact.

3.4 ECONOMIC EFFECTS

For additional information regarding potential economic effects along the South Central Avenue corridor, refer to Appendix B, *Economic Development Technical Memorandum*.

3.4.1 Environmental Setting

The South Central study area has a diverse mix of land uses driving the local economy. Most of the study area has low-density commercial development adjacent to the roadway, with single-family residential and industrial uses adjacent to or behind the commercial uses. Downtown Phoenix, in the northern portion of study area, is one of the region's largest employment centers and home to several financial and governmental institutions, including county and federal courts, and numerous major activity centers such as the Phoenix Convention Center, Talking Stick Resort Arena and Chase Field. Over the last 15 years, Downtown Phoenix has transformed into a diverse and 24-hour destination with such developments as the ASU Downtown Campus, the Phoenix Biomedical Campus and Cityscape, a high-rise mixed-use development. The Warehouse District, in the southern portion of Downtown Phoenix, has seen increased economic development with the conversion of old warehouses into office space, restaurants and housing. South of the Warehouse District to I-17, the corridor features predominantly single-family housing with little recent economic development. The Nina Mason Pulliam Rio Salado Audubon Center and the Rio Salado Habitat Restoration Area (RSHRA), both completed in 2009, resulted from over \$100 million in public and private investment. These developments were the largest recent investments in the study area. Directly south of the Nina Mason Pulliam Rio Salado Audubon Center, the study area has predominantly industrial uses that have been operating in the area for quite some time. South of this area, these uses give way to single-family housing again, with low-density commercial adjacent to the roadway.

The City of Phoenix has worked on multiple revitalization programs in the South Central study area. The Matthew Henson, Hope VI Revitalization Program was the City's initial revitalization effort, converting a public housing project into new housing, a community resource center and a youth center on the northwestern corner of 7th Avenue and Buckeye Road. The Marcos de Niza family housing project at 3rd Avenue and Pima Street has recently been rehabilitated into family housing with several social service amenities, such as a local senior center. A proposed large-scale development called Plaza de las Culturas on a large vacant parcel on the northwestern corner of Pioneer Street and Central Avenue may continue this type of revitalization.

3.4.2 No-Build Alternative

The No-Build Alternative represents conditions in 2035 if the South Central Light Rail Extension is not built and is defined as the existing transit and roadway/highway system plus programmed (committed) transportation improvement projects, as discussed in Section 2.2.1.

The No-Build Alternative would have little impact on property values, development, tax revenues or employment because it includes only improvements to the transportation network previously programmed for implementation noted above. The No-Build Alternative would not stimulate economic development activities directly within the study area to the level of the Build Alternative, generate fiscal impacts or create the need for additional government services. While the No-Build Alternative would require few, if any, property acquisitions that would reduce property tax revenues over the short- or long-term time frames, it would also not encourage new development that would have the long-term benefits of increasing both sales and property tax revenues.

3.4.3 Build Alternative

The Build Alternative is anticipated to have positive economic effects for the study area, the City of Phoenix and the region as a whole by capitalizing on the rapid urban development currently occurring in the Downtown area and fostering future growth in the corridor that conforms to the City's vision for a sustainable, transit-oriented development pattern. 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 mostly be on a regional basis, because not all employees or materials necessary for construction and operation of the light rail would come from the City of Phoenix. Additionally, some short-term benefits in the study area would come from construction workers patronizing local businesses such as restaurants, gas stations, etc. While the long-term direct economic impacts would be positive for both the local and regional economy, most of the short-term economic benefits likely would be experienced outside the corridor.

3.4.3.1 How Can the Build Alternative Influence Property Values?

Previous studies around the country have illustrated the positive economic effects fixed-guideway transit facilities can have on surrounding property values because of 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 along the corridor, especially near the light rail stations.

Based on development trends witnessed along Valley Metro's existing light rail line, the Build Alternative is expected to attract new, transit-supportive development within the Build Alternative area. As of July 2015, approximately \$8.2 billion in new development has been completed or is under construction along the existing light rail alignment (within one-half mile of a station), which does not include an additional \$342 million worth of planned projects. Approximately \$4.7 billion of this development has occurred along Phoenix's portion of the light rail line. The City's experience with light rail has proven that it can encourage development growth in areas better served by transit—driven by complementary land use and tourism policies—and have a positive effect on property values

3.4.3.2 How Can the Build Alternative Affect New Development Locally?

The Build Alternative is anticipated to have positive effects on both commercial and residential development near light rail stations. It is anticipated that new development in the study area would capture an increasing share of residential and employment growth as densities increase. The Build Alternative is an integral part of local plans by the City of Phoenix, such as the General Plan, and is identified in regional plans including the MAG RTP as a fixed-guideway corridor for implementation as part of the region's future network of HCT corridors.

More than 277.2 acres of vacant and underdeveloped sites along the corridor provide ample opportunity for new development within the study area, conforming to the City's vision of a sustainable, transit-supportive urban development pattern. Phoenix has pursued an aggressive adaptive-reuse program, having established a program in 2008 that makes it easier and less expensive to reuse buildings in the city. The availability of developable land, coupled with prodevelopment policies, provides a foundation for the Build Alternative to support development and redevelopment in the study area (refer to Section 3.5.1 for detailed information).

3.4.3.3 How is the Proposed Build Alternative Expected to Affect Tax Revenues, Employment and Overall Economic Development?

Construction and continuing operation of the Build Alternative, funded in part with the City's Proposition 104 sales tax for transportation, would 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. Construction of the Build Alternative would expand local earnings for the duration of the construction cycle. Operation of the Build Alternative is anticipated to stimulate local economic activity through increased earnings and output, particularly around light rail stations. Table 3-9 summarizes the anticipated effects on tax revenues and employment.

Because the Build Alternative is primarily within existing ROW, it would mostly require partial acquisition of properties along the alignment. Five full parcel acquisitions are required for the Build Alternative, with the potential for one additional full parcel acquisition for a TPSS site. Land acquisition would remove the affected portions of properties from the existing local tax base, thus resulting in a small reduction in annual tax revenues. However, an increase in other tax revenues would offset such losses. The creation of new jobs and earnings associated with recurring operations and maintenance spending would foster greater retail spending. Additional revenues from this spending would be recurring gains.

The Build Alternative would displace one business and has the potential to displace a second business depending on the final selection of TPSS sites. Because ample vacant and underutilized land exists in the study area, all efforts would be made to relocate these businesses within the corridor. If they are successfully relocated within the corridor, no impact on sales tax revenue would occur. If they are not relocated within the corridor, the minimal loss in sales tax revenue would likely be offset by gains from new businesses opening or relocating to station areas and potential increases in sales tax revenues for current area businesses. Phoenix has experienced significant growth in commercial and residential floor space surrounding the existing LRT alignment, contributing to growth in the city's sales tax base.

**TABLE 3-9: ANTICIPATED EFFECTS OF THE BUILD
ALTERNATIVE ON TAX REVENUES AND EMPLOYMENT**

Factor	Anticipated Effects
Tax revenues	<u>Property taxes</u> – The Build Alternative is primarily within existing ROW and therefore would mostly require partial property acquisitions. The Build Alternative would require five full parcel acquisitions, with the potential for one additional full parcel acquisition for a TPSS site. With relatively few property acquisitions along the alignment, the reduction in the County's and City's property tax bases would be minimal and would likely be offset by the increase of other tax revenues as a result of the Build Alternative.
	<u>Sales taxes</u> – The displacement of one business and potential displacement of a second business (depending on the final TPSS site selections) in the corridor could result in the loss of sales tax revenue. However, all efforts would be made to relocate the displaced businesses within the corridor because ample vacant and underutilized land is available. If the businesses are not relocated within the corridor, the long-term effect on property and sales taxes would still likely be positive because of gains from new businesses opening or businesses relocating to station areas and potential increases in sales tax revenues for current area businesses.
Employment	<u>Direct employment</u> – New and sustained employment opportunities would be created to operate and maintain the additional length of the light rail system.
	<u>Indirect employment</u> – Long-term employment opportunities would likely be only partially driven by operations and maintenance of the system; long-term employment would more likely 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.

Notes: ROW = right-of-way, TPSS = traction power substation

The Build Alternative is anticipated to add more jobs than may be lost or displaced as a result of property acquisitions. 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 in 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 on tax revenues and employment in the study area, the City of Phoenix and the region.

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

3.4.4 Mitigation

No mitigation is necessary. The Build Alternative would primarily result in both short-term beneficial economic impacts during the construction period and long-term impacts to the local economy directly along the alignment and more regionally based on the continued expansion of the light rail system in Phoenix, Tempe and Mesa.

3.5 GROWTH AND GROWTH-INDUCED IMPACTS

3.5.1 Environmental Setting

Growth-induced impacts occur as a result of an action and are generally later in time or farther removed in distance but are still reasonably foreseeable. Proactive plans and policies help support development resulting from growth-induced impacts. As discussed previously in Section 3.3, numerous plans have been completed that will guide future development in the study area. Several potential areas for redevelopment have been identified along the Build Alternative corridor and near proposed light rail stations. Scattered throughout the corridor, these areas present opportunities to increase residential and commercial densities. For additional information on economic effects, refer to Appendix B, *Economic Development Technical Memorandum*.

With regard to proactive plans and policies, the City of Phoenix has enacted several such plans and land development policies to guide future growth and development of the city. In its 2015 General Plan, the City identifies infill development as a priority and outlines policies aimed at encouraging such development, including the Adaptive Reuse Program and the Infill Development Overlay District. The goal of these efforts is “to promote development of vacant parcels or the redevelopment of underutilized parcels within the developed area of the city that is consistent with the character of the area or with the area’s transitional objectives.” An analysis of MAG 2012 data indicates that approximately 277.2 acres of vacant land exist in the study area, plus additional acreage of surface parking lots prime for future redevelopment. Furthermore, a substantial amount of land within one-half mile of the station areas is underutilized or developed with very low-density uses. As such, this land could accommodate even more future development.

Transit-oriented development is another growth-inducing element that is identified as a priority in the 2015 General Plan, with the City committed to designing “areas surrounding light rail and major transit corridors to create a walkable environment and increase activity.” The City identifies Central Avenue as one such area and states its intention to support the “continued development of the Central Avenue as the city’s transit spine and principal street of Phoenix.” The City has taken several actions—including adopting the Transit Oriented Development Overlay District and the Walkable Urban Code—to ensure that future development and redevelopment are consistent with and complementary to the community’s focused investment in transit, bicycle and pedestrian infrastructure.

3.5.2 No-Build Alternative

The No-Build Alternative represents conditions in 2035 if the South Central Light Rail Extension is not built and is defined as the existing transit and roadway/highway system

plus programmed (committed) transportation improvement projects, as discussed in Section 2.2.1.

The No-Build Alternative is not expected to promote growth at the potential level of the Build Alternative. 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 2-4 in Chapter 2.0). Without a major infrastructure investment in the area that the Build Alternative would provide, 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 3.3, the Build Alternative is consistent with the City's efforts to create more sustainable and transit-supportive development patterns. 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 and in the vicinity of the corridor. The Build Alternative would enhance the potential for land use intensification by improving transit accessibility throughout the study area and by providing connections with other parts of the existing and planned regional transit system. The City of Phoenix, along with stakeholders, anticipates that the Build Alternative would have positive effects on induced commercial and residential development near proposed stations and the light rail alignment.

3.5.4 Mitigation

No mitigation is needed. The Build Alternative would generally result in beneficial impacts regarding the potential for future growth induced by implementing the Build Alternative, based on the plans and policies developed by the City of Phoenix, other county and regional organizations and related stakeholders.

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

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

3.6.1 Environmental Setting

The roadways where the planned light rail extension would operate—1st and Central Avenues—are classified as arterial streets. The other major crossing and adjacent parallel streets within the study area, also arterial streets, include: Buckeye Road, Broadway Road, Southern Avenue, Baseline Road, 7th Street and 7th Avenue. Arterial streets are designed to carry large volumes of traffic and to accommodate transit, bicyclists and pedestrians. I-17 also exists in the study area as a major Interstate, connecting the Phoenix metropolitan area with Flagstaff, Arizona. I-17 traffic

interchanges at 7th Street and 7th Avenue provide direct access on and off I-17. The intersection at Central Avenue is connected with the I-17 frontage roads, but lacks direct access to I-17.

Level of service (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). The afternoon (PM) peak (between 3 and 6 p.m.) is the time typically selected for intersection analysis because it most often represents the most congested traffic conditions of the day (see Figures 3-3 and 3-4 for all intersections evaluated). Under 2015 conditions, most of the intersections operate at a LOS A to E during the PM peak (Table 3-12, shown later in Section 3.6.3.1). One unsignalized intersection (Central Avenue and Watkins Street) approach from the side street currently operates at LOS F.

On-street and off-street parking is a valuable asset for local residents and businesses. Parking in the Build Alternative area consists primarily of surface lots, except in the Downtown area, where multistory parking structures can be found. On-street parking along the light rail route is limited, only occurring on 1st Avenue between Jefferson and Madison Streets where three metered spaces exist. Five parking spaces also currently exist on the western side of Central Avenue between Madison and Jefferson Streets. Nearby are 13 additional spaces on Madison Street (10 on the northern side and 3 on the southern side) between 1st and Central Avenues and 8 spaces on the northern side of Jefferson Street between 1st and Central Avenues. Refer to Tables 3-14 and 3-15 in Section 3.6.3.2 for a complete list of on-street parking locations along the alignment.

One loading zone space is along the route on 1st Avenue just south of Jefferson Street adjacent to a currently vacant building. Curbside loading zones can accommodate deliveries and pick-up, drop-off activities out of the travel lanes.

Nonmotorized transportation is a significant component of existing and planned mobility in Downtown Phoenix and the South Central corridor. The most pedestrian and bicyclist activity occurs along the Downtown portion of the proposed light rail extension route. The City of Phoenix and the local bicycling community have placed extreme importance on maintaining existing bicycle lanes and adding new ones. The Phoenix Sonoran bikeway is a key bicycle route in Phoenix. This route runs along the study alignment on Central Avenue. The Sonoran Bikeway is a specially designated route that connects South Mountain Park and the Phoenix Sonoran Preserve (about 40 miles total). It is predominantly a Class II facility (operates in a bicycle lane), although some portions are Class III (bicycle route). The City of Phoenix 2014 Comprehensive Bicycle Master Plan “designates bicycle facilities into two functional categories: recreational paths within city parks, desert preserves, which are generally implemented and maintained by the Parks and Recreation Department; and commuter/transportation-related facilities located within street corridors under the jurisdiction of the Street Transportation Department and along canals under the jurisdiction of Salt River Project.” According to this definition in the Comprehensive Bike Master Plan, the Sonoran Bikeway is designated as primarily a commuter/transportation facility within street corridors.

FIGURE 3-3: INTERSECTIONS EVALUATED – NORTHERN SECTION

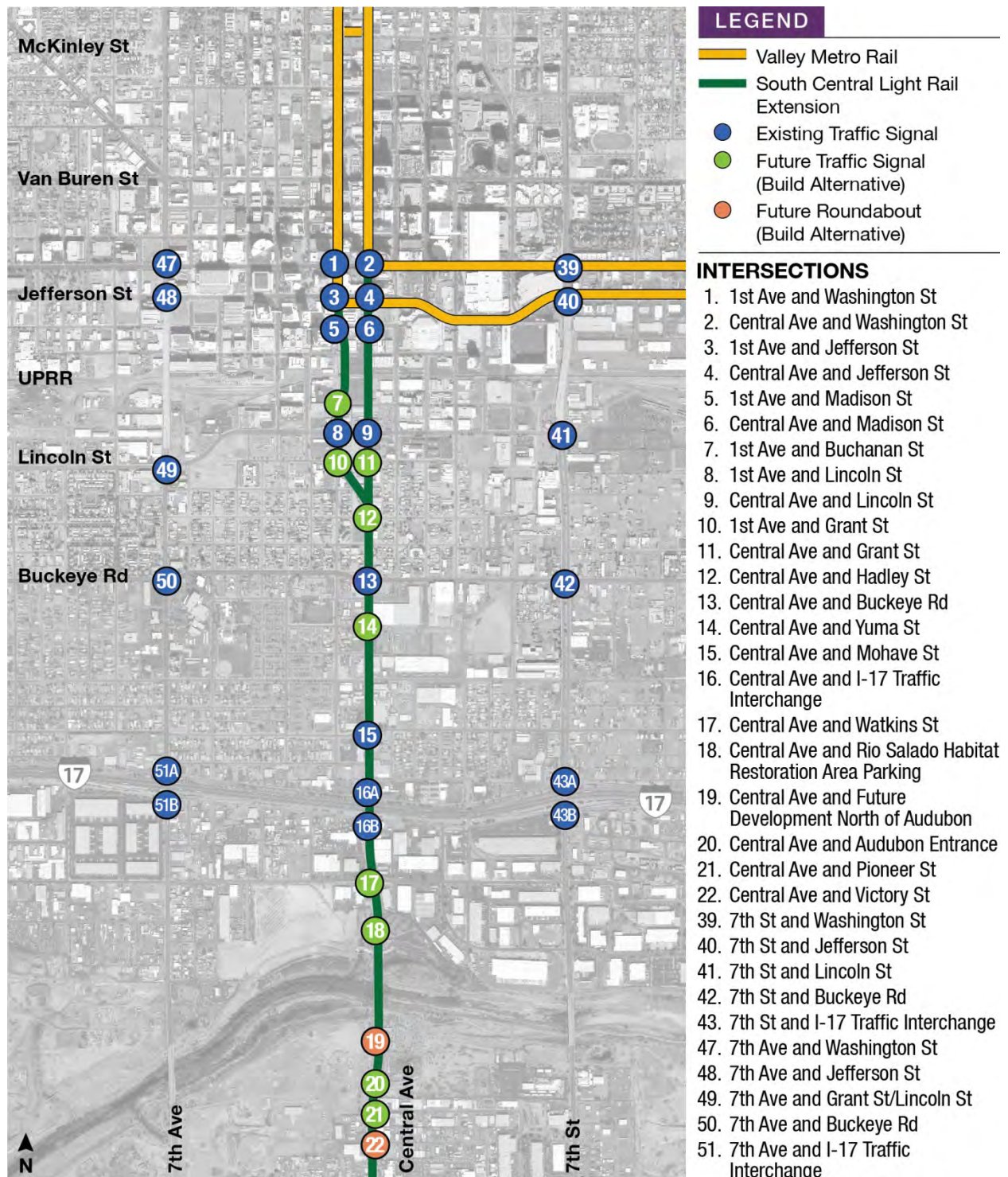
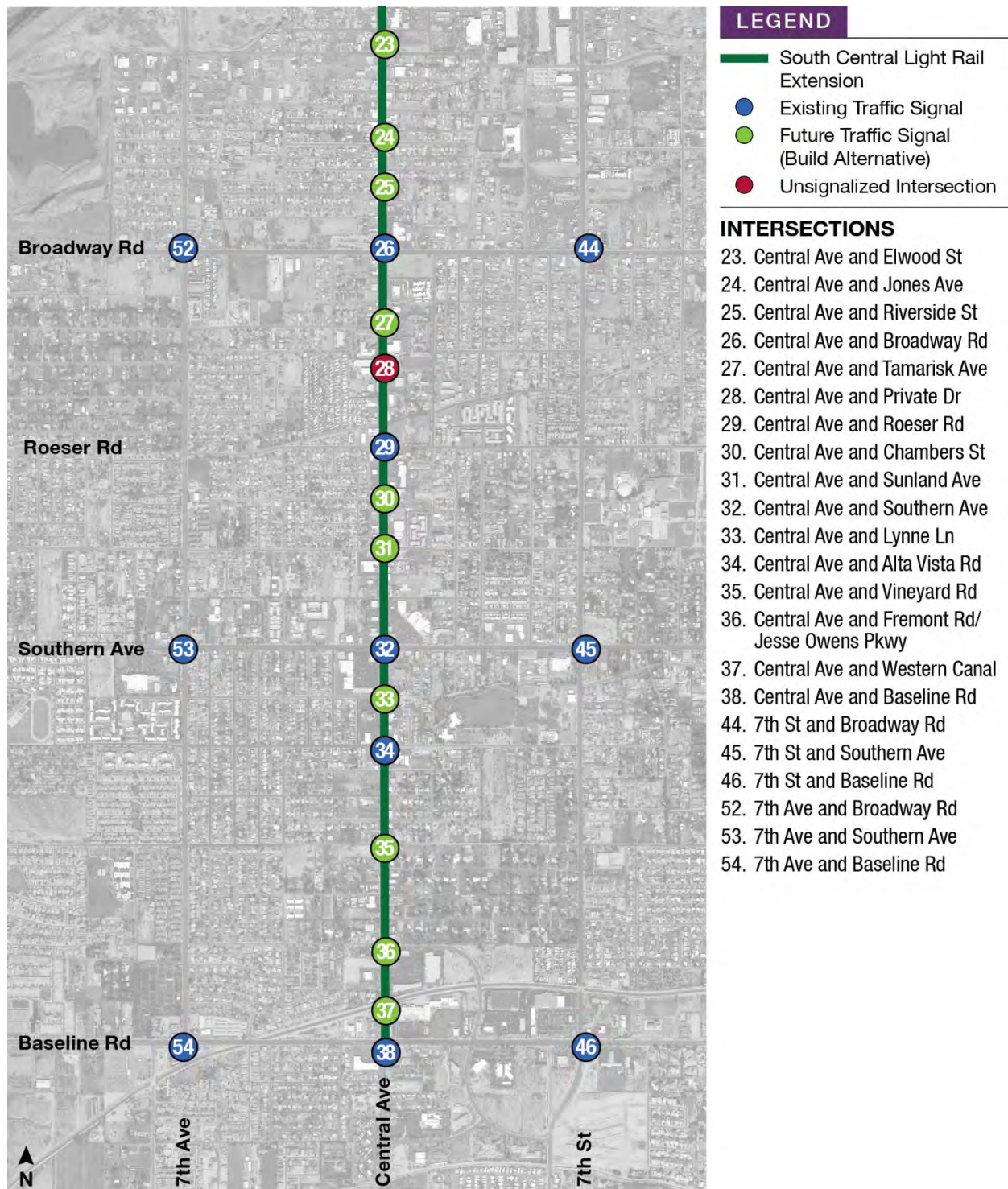


FIGURE 3-4: INTERSECTIONS EVALUATED – SOUTHERN SECTION



Central Avenue, between Jefferson Avenue (north) and South Mountain Park (south of Highline Canal), serves as a critical component of the Sonoran Bikeway. This bikeway is not the only bicycle facility in the study area. Several other facilities cross perpendicular to Central Avenue at Southern Avenue, Roeser Road and Durango Street. In addition, other bicycle facilities are along 7th Street and 7th Avenue.

The regional transit system in the vicinity of the South Central corridor consists of commuter and local buses, local circulators, a local connector and the 23-mile existing light rail line that serves Phoenix, Tempe and Mesa. Existing light rail stations in the traffic analysis study area pertinent to the transportation study are:

- Washington/Central Ave
- Jefferson/1st Ave

Valley Metro currently provides light rail service between Phoenix and Mesa. On weekdays, the current span of service is from about 4 a.m. to midnight with a frequency of service ranging from 12 to 20 minutes, depending on the time of day and day of the week.

Table 3-10 summarizes existing local and circulator bus transit service, and Table 3-11 lists regional bus service that operates on or near the planned South Central Light Rail Extension route and station locations.

**TABLE 3-10: LOCAL AND CIRCULATOR BUS
TRANSIT ROUTES – 2015 CONDITIONS**

Route	Corridor/Description	Weekday Service Frequency (minutes)	
		Peak	Off-Peak
Local Bus			
Route 0	Central Ave	10	20
Route 1	Washington St/Jefferson Ave	30	30
Route 3	Van Buren St	15	15
Route 7	7th St	20	30
Route 8	7th Ave	30	30
Route 10	Roosevelt St	30	30
Route 13	Buckeye Rd	30	35
Route 45	Broadway Rd	15	30
Route 52	Roeser Rd	30	30
Route 61	Southern Ave	15	30
Route 77	Baseline Rd	30	30
Circulator Bus			
Phoenix Business Circulator DASH	Washington St/Jefferson Ave	12	12

TABLE 3-11: REGIONAL BUS TRANSIT ROUTES – 2015 CONDITIONS

Route	Corridor/Description	Weekday Service Frequency (minutes)	
		Peak	Off-Peak
Express Bus			
Route 514	Scottsdale Express	90	None
Route 520	Tempe Express	90	None
Route 521	Tempe Express	45	None
Route 522	Tempe Express	45	None
Route 531	Mesa/Gilbert Express	30	None
Route 533	Mesa Express	30	None
Route 535	Northeast Mesa Express	36	None
Route 541	Chandler Express	45	None
Route 542	Chandler Express	45	None
Route 562	Goodyear Express	45	None
Route 563	Avondale/Buckeye Express	45	None
Route 571	Surprise Express	45	None
Route 573	Northwest Valley Express	45	None
Route 575	Northwest Valley Express	60	None
Grand Avenue Limited	Connects Grand Avenue to Downtown Phoenix	90	None
RAPID Bus			
Central South Mountain East	Connects Baseline Rd to Downtown Phoenix via Central Ave	25–30	None
Central South Mountain West	Connects Baseline Rd to Downtown Phoenix via Central Ave	25–30	None
I-10 East	Connects I-10 East to Downtown Phoenix	10–20	None
I-10 West	Connects I-10 West to Downtown Phoenix	10–20	None
I-17	Connects I-17 to Downtown Phoenix	10–20	None
SR 51	Connects SR 51 to Downtown Phoenix	10–20	None
Arizona State University (ASU) Shuttle			
Mercado Shuttle	Connects ASU Tempe and ASU Downtown	60	60
Maroon Shuttle	Connects ASU Tempe, ASU Downtown and ASU West	30	30

Notes: I-10 = Interstate 10, I-17 = Interstate 17, SR = State Route

ASU operates a private bus service to shuttle students, faculty and staff between campuses, including the Downtown Campus near the Build Alternative route. Section 2.2.1.2 of Chapter 2.0 provides additional information about other transit routes operating in the study area, including two maps (Figures 2-4 and 2-5) showing the routes. Although the figures in Chapter 2.0 show the No-Build routes, all routes under the No-Build are the same as 2015 transit network. The only difference between the 2015 network and No-Build network is the headway (frequency) for Route 3, which is improved from 15 minutes (peak/off-peak) to 10 minutes (peak/off-peak).

3.6.2 No-Build Alternative

Under the No-Build Alternative, the increase in traffic volumes with minimal planned roadway improvements by 2035 is expected to cause increases in travel time, along with some added traffic delays at intersections in the study area. The City of Phoenix considers an intersection operating at LOS A through E during the peak period to be acceptable. LOS F during the peak period is unacceptable. The City of Phoenix, as part of its ongoing traffic signal maintenance program, regularly optimizes signals throughout the city, as discussed in Chapter 2.0. With signal optimization in the study area, no signalized intersection would operate at LOS F under the No-Build Alternative. Therefore, the No-Build Alternative would have no adverse impact on signalized intersections.

Several unsignalized intersections would experience increased delays compared with existing 2015 conditions as motorists stop at the side streets approaches and wait for gaps in the traffic on Central Avenue so they can either turn right, left, or go through from the unsignalized intersection.

Six unsignalized intersections would operate at LOS F at the side street approaches in the No-Build Alternative. According to the City of Phoenix criteria, the No-Build Alternative would have an adverse impact on the following intersections:

- Central Avenue and Watkins Street
- Central Avenue and Victory Street
- Central Avenue and Elwood Street
- Central Avenue and Riverside Street
- Central and Tamarisk Avenues
- Central and Sunland Avenues

Table 3-12 (see Section 3.6.3.1) shows the specific increase in delays (in seconds) for each intersection.

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 require the removal of parking (other than the possible result of planned development in and near the Build Alternative area). In these cases, City of Phoenix zoning regulations would dictate parking requirements, which are based on providing appropriate parking supply for new development.

No loading zone impacts are anticipated for the No-Build Alternative because no planned developments, roadway geometry changes or construction activity would affect the loading zones. All existing pedestrian and bicycle facilities would be preserved and maintained in the No-Build Alternative. No planned developments, roadway geometry changes or construction activity would affect the pedestrian and bicycle facilities.

The No-Build Alternative would also have no adverse impacts on current transit services. Light rail operations in the area would be the same as with 2015 conditions because no planned route changes or construction activity would affect transit operations. Local bus Route 3, which operates along Van Buren Street, would have an

improved headway of 10 minutes between 51st Avenue and 48th Street under the No-Build Alternative compared with 15-minute headways under 2015 conditions. No other changes to Valley Metro bus routes in the No-Build Alternative would occur compared with 2015 conditions. However, the No-Build Alternative would not have the same benefit as the Build Alternative because no light rail service would be extended south of Washington and Jefferson Streets to provide riders with an additional transportation option with enhanced convenience, reliability and access to the regional transit system. In addition, the No-Build Alternative would likely experience slower transit travel times through the corridor than the Build Alternative since light rail gets priority signaling, meaning that the light rail makes fewer stops at traffic signals than buses which, like automobiles traveling in the same traffic lanes, have no priority signaling.

3.6.3 Build Alternative

This section summarizes the transportation impact assessments for the Build Alternative. The traffic, parking, pedestrians and bicycles, loading zones, truck routes and transit impacts findings are presented.

3.6.3.1 Traffic

The City of Phoenix Street Transportation Department has established the following criteria for the proposed Build Alternative to determine what constitutes an impact at an intersection. The criteria are based on a comparison of LOS and delay between the Build and No-Build Alternatives, as follows:

- For LOS A to D, if the Build Alternative maintains the same or improved LOS compared with the No-Build Alternative, it is not an adverse impact. However, if the Build Alternative LOS degrades below that of the No-Build Alternative, delays of greater than 5 percent would be an adverse impact and would require mitigation.
- For LOS E, the delay for the Build Alternative must be greater than 5 percent compared with the No-Build Alternative to be an adverse impact. Mitigation would be required for the adverse impact.
- LOS F would be an adverse impact and would require mitigation.

Build Alternative Analysis Results and Comparison with No-Build Alternative and 2015 Conditions

Table 3-12 compares the LOS and delay (in seconds) for the PM peak at the intersections presented in Figures 3-3 and 3-4 for several scenarios: 2015 conditions, No-Build Alternative and Build Alternative.

TABLE 3-12: INTERSECTION LEVEL OF SERVICE AND DELAY (PM PEAK)

Int. ID ^a	Intersection Name	2015 Conditions		No-Build		Build	
		Delay (seconds)	LOS	Delay (seconds)	LOS	Delay (seconds)	LOS
1	1st Ave and Washington St	29	C	29	C	32	C
2	Central Ave and Washington St	15	B	16	B	15	B
3	1st Ave and Jefferson St	21	C	34	C	20	B
4	Central Ave and Jefferson St	12	B	13	B	15	B
5	1st Ave and Madison St	2	A	2	A	4	A
6	Central Ave and Madison St	16	B	16	B	12	B
7	1st Ave and Buchanan St ^e	—	—	—	—	4	A
8	1st Ave and Lincoln St	28	D	28	C	10	B
9	Central Ave and Lincoln St	18	B	18	B	19	B
10	1st Ave and Grant St	15 ^b	C ^b	17 ^b	C ^b	11	B
11	Central Ave and Grant St	11 ^b	B ^b	12 ^b	B ^b	12	B
12	Central Ave and Hadley St	13 ^b	B ^b	14 ^b	B ^b	3	A
13	Central Ave and Buckeye Rd	55	E	41	D	35	C
14	Central Ave and Yuma St ^e	—	—	—	—	6	A
15	Central Ave and Mohave St	8	A	8	A	6	A
16a	Central Ave and I-17 TI WB ramps	20	C	27	C	25	C
16b	Central Ave and I-17 TI EB ramps	14	B	15	B	12	B
17	Central Ave and Watkins St	78 ^b	F ^b	>80 ^b	F ^b	11	B
18	Central Ave and Rio Salado Habitat Restoration Area Parking	17 ^b	C ^b	23 ^b	C ^b	2	A
19	Central Ave and Future Development North of Audubon ^c	—	—	—	—	—	—
20	Central Ave and Audubon entrance	21 ^b	C ^b	29 ^b	D ^b	14	B
21	Central Ave and Pioneer St	18 ^b	C ^b	25 ^b	C ^b	12	B
22	Central Ave and Victory St	35 ^b	E ^b	59 ^b	F ^b	30 ^d	D ^d
23	Central Ave and Elwood St	29 ^b	D ^b	63 ^b	F ^b	12	B
24	Central Ave and Jones Ave	27 ^b	D ^b	44 ^b	E ^b	4	A
25	Central Ave and Riverside St	38 ^b	E ^b	>80 ^b	F ^b	8	A
26	Central Ave and Broadway Rd	38	D	38	D	46	D
27	Central Ave and Tamarisk Ave	21 ^b	C ^b	50 ^b	F ^b	7	A
28	Central Ave and private drive ^e	—	—	—	—	12.3 ^b	B ^b
29	Central Ave and Roeser Rd	15	B	15	B	19	B
30	Central Ave and Chambers St	15 ^b	C ^b	19 ^b	C ^b	10	B
31	Central Ave and Sunland Ave	48 ^b	E ^b	>80 ^b	F ^b	9	A
32	Central Ave and Southern Ave	40	D	62	E	47	D
33	Central Ave and Lynne Ln	11 ^b	B ^b	12 ^b	B ^b	6	A

Int. ID ^a	Intersection Name	2015 Conditions		No-Build		Build	
		Delay (seconds)	LOS	Delay (seconds)	LOS	Delay (seconds)	LOS
34	Central Ave and Alta Vista Rd	15	B	20	B	11	B
35	Central Ave and Vineyard Rd	14 ^b	B ^b	17 ^b	C ^b	6	A
36	Central Ave and Fremont Rd/Jesse Owens Pkwy	21 ^b	C ^b	32 ^b	D ^b	14	B
37	Central Ave and Western Canal ^e	—	—	—	—	8	A
38	Central Ave and Baseline Rd	36	D	56	E	54	D
39	7th St and Washington St	56	E	28	C	37	D
40	7th St and Jefferson St	33	C	34	D	29	C
41	7th St and Lincoln St	15	B	18	B	18	B
42	7th St and Buckeye Rd	49	D	50	D	53	D
43a	7th St and I-17 TI WB ramps	33	C	44	D	75	E
43b	7th St and I-17 TI EB ramps	31	C	49	D	80	E
44	7th St and Broadway Rd	35	D	53	D	54	D
45	7th St and Southern Ave	39	D	57	E	59	E
46	7th St and Baseline Rd	50	D	76	E	79	E
47	7th Ave and Washington St	31	C	25	C	25	C
48	7th Ave and Jefferson St	30	C	30	C	29	C
49	7th Ave and Grant St/Lincoln St	16	B	17	B	20	B
50	7th Ave and Buckeye Rd	30	C	35	C	34	C
51a	7th Ave and I-17 TI WB ramps	31	C	56	E	70	E
51b	7th Ave and I-17 TI EB ramps	33	C	49	D	65	E
52	7th Ave and Broadway Rd	44	D	63	E	64	E
53	7th Ave and Southern Ave	30	C	53	D	68	E
54	7th Ave and Baseline Rd	21	C	27	C	37	D

Notes: Level of service from HCM2000 Synchro reports. Bolded italics indicate intersections adversely affected by the Build Alternative.

EB = eastbound, I-17 = Interstate 17, LOS = level of service, TI = traffic interchange, WB = westbound

^a Corresponds to numbered intersections in Figures 3-3 and 3-4.

^b Unsignalized intersection approach with highest delay and corresponding approach LOS.

^c Intersection was not evaluated at this time since no specific development plans have been proposed and thus sufficient information about proposed traffic generated by the development does not exist.

^d Roundabout – 15-second delay added to HCM2010 intersection delay to account for gate operation. The 15 seconds is for train (light rail transit) clearance, as discussed and agreed with City of Phoenix.

^e Intersection locations where no existing or No-Build data exists. In these cases, Build Alternative traffic volumes were predicted based on traffic volumes at adjacent intersections.

Intersections Operating at Same LOS for Build Alternative, No-Build Alternative and 2015 Conditions

Nineteen intersections would operate at the same LOS in all three scenarios considered: 2015 conditions and the No-Build and Build Alternatives. These are presented in Table 3-13. The table also shows the corresponding increase or decrease in delay of the Build Alternative compared with 2015 conditions and the No-Build Alternative.

TABLE 3-13: INTERSECTIONS OPERATING AT SAME LOS IN 2015 CONDITIONS, NO-BUILD ALTERNATIVE AND BUILD ALTERNATIVE^a

Int. ID ^b	Intersection Name	LOS	Build Delay Compared with 2015 Conditions	Build Delay Compared with No-Build
1	1st Ave and Washington St	C	3 second increase	3 second increase
2	Central Ave and Washington St	B	same as 2015 conditions	1 second decrease
4	Central Ave and Jefferson St	B	3 second increase	2 second increase
5	1st Ave and Madison St	A	2 second increase	2 second increase
6	Central Ave and Madison St	B	4 second decrease	4 second decrease
9	Central Ave and Lincoln St	B	1 second increase	1 second increase
15	Central Ave and Mohave St	A	2 second decrease	2 second decrease
16a	Central Ave and I-17 TI WB ramps	C	5 second increase	2 second decrease
16b	Central Ave and I-17 TI EB ramps	B	2 second decrease	3 second decrease
26	Central Ave and Broadway Rd	D	8 second increase	8 second increase
29	Central Ave and Roeser Rd	B	4 second increase	4 second increase
34	Central Ave and Alta Vista Rd	B	4 second decrease	9 second decrease
41	7th St and Lincoln St	B	3 second increase	same as No-Build
42	7th St and Buckeye Rd	D	4 second increase	3 second increase
44	7th St and Broadway Rd	D	19 second increase	1 second increase
47	7th Ave and Washington St	C	6 second decrease	same as No-Build
48	7th Ave and Jefferson St	C	1 second decrease	1 second decrease
49	7th Ave and Grant St/Lincoln St	B	4 second increase	3 second increase
50	7th Ave and Buckeye Rd	C	5 second increase	1 second decrease

Notes: EB = eastbound, I-17 = Interstate 17, LOS = level of service, TI = traffic interchange, WB = westbound

^a Although all scenarios share the same LOS, the seconds of delay generally vary as shown in the table.

^b Corresponds to numbered intersections in Figures 3-3 and 3-4.

Differences between Build Alternative and 2015 Conditions

Compared with 2015 conditions, the Build Alternative has a better or same LOS and less delay at the following intersections:

- 1st and Jefferson Avenues – operates at LOS B with Build Alternative versus LOS C in 2015 conditions
- 1st Avenue and Lincoln Street – operates at LOS B with Build Alternative versus LOS D in 2015 conditions
- Central Avenue and Buckeye Road – operates at LOS C with Build Alternative versus LOS E in 2015 conditions
- 7th and Jefferson Streets – operates at LOS C with Build Alternative and 2015 conditions
- 7th and Washington Streets – operates at LOS D with Build Alternative versus LOS E in 2015 conditions

The Build Alternative has the same LOS and more delay at the following intersections than with 2015 conditions:

- Central and Southern Avenues – operates at LOS D with Build Alternative and 2015 conditions
- Central Avenue and Baseline Road – operates at LOS D with Build Alternative and 2015 conditions

The Build Alternative has a lower LOS and more delay at the following intersections than with 2015 conditions:

- 7th Street and I-17 westbound ramps – operate at LOS E with Build Alternative versus LOS C in 2015 conditions
- 7th Street and I-17 eastbound ramps – operate at LOS E with Build Alternative versus LOS C in 2015 conditions
- 7th Street and Southern Avenue – operates at LOS E with Build Alternative versus LOS D in 2015 conditions
- 7th Street and Baseline Road – operates at LOS E with Build Alternative versus LOS D in 2015 conditions
- 7th Avenue and I-17 westbound ramps – operate at LOS E with Build Alternative versus LOS C in 2015 conditions
- 7th Avenue and I-17 eastbound ramps – operate at LOS E with Build Alternative versus LOS C in 2015 conditions
- 7th Avenue and Broadway Road – operates at LOS E with Build Alternative versus LOS D in 2015 conditions
- 7th and Southern Avenues – operates at LOS E with Build Alternative versus LOS D in 2015 conditions

- 7th Avenue and Baseline Road – operates at LOS D with Build Alternative versus LOS C in 2015 conditions

Differences between Build Alternative and No-Build Alternative

Compared with the No-Build Alternative, the Build Alternative has a better LOS and less delay at the following intersections:

- 1st and Jefferson Avenues – operates at LOS B with Build Alternative versus LOS C with No-Build Alternative
- 1st Avenue and Lincoln Street – operates at LOS B with Build Alternative versus LOS C with No-Build Alternative
- Central Avenue and Buckeye Road – operates at LOS C with Build Alternative versus LOS D with No-Build Alternative
- Central and Southern Avenues – operates at LOS D with Build Alternative versus LOS E with No-Build Alternative
- Central Avenue and Baseline Road – operates at LOS D with Build Alternative versus LOS E with No-Build Alternative
- 7th and Jefferson Streets – operates at LOS C with Build Alternative versus LOS D with No-Build Alternative

The Build Alternative has the same LOS and more delay at the following intersections than with the No-Build Alternative:

- 7th Street and Southern Avenue – operates at LOS E with Build and No-Build Alternatives
- 7th Street and Baseline Road – operates at LOS E with Build and No-Build Alternatives
- 7th Avenue and I-17 westbound ramps – operate at LOS E with Build and No-Build Alternatives
- 7th Avenue and Broadway Road – operates at LOS E with Build and No-Build Alternatives

The Build Alternative has a lower LOS and more delay at the following intersections than with the No-Build Alternative:

- 7th and Washington Streets – operates at LOS D with Build Alternative versus LOS C with No-Build Alternative
- 7th Street and I-17 westbound ramps – operate at LOS E with Build Alternative versus LOS D with No-Build Alternative
- 7th Street and I-17 eastbound ramps – operate at LOS E with Build Alternative versus LOS D with No-Build Alternative
- 7th Avenue and I-17 eastbound ramps – operate at LOS E with Build Alternative versus LOS D with No-Build Alternative

- 7th and Southern Avenues – operate at LOS E with Build Alternative versus LOS D with No-Build Alternative
- 7th Avenue and Baseline Road – operate at LOS D with Build Alternative versus LOS C with No-Build Alternative

Unsignalized Intersections

The minor unsignalized street intersections that would experience longer delays on side streets with the No-Build Alternative would be signalized in the Build Alternative. Nineteen intersections would be signalized as part of the Build Alternative, and their locations are shown as green and red dots in Figures 3-3 and 3-4. These intersections would operate at LOS D or better.

Most of the unsignalized intersections under 2015 conditions and the No-Build Alternative are either proposed for signalization or roundabout with implementation of the Build Alternative. With the new traffic control associated with the Build Alternative, the following intersections operate at a better LOS and have less intersection delay than under 2015 conditions or the No-Build Alternative:

- 1st Avenue and Grant Street
- Central Avenue and Grant Street
- Central Avenue and Hadley Street
- Central Avenue and Watkins Street
- Central Avenue and Rio Salado Habitat
- Central Avenue and Audubon entrance
- Central Avenue and Pioneer Street
- Central Avenue and Victory Street
- Central Avenue and Elwood Street
- Central and Jones Avenues
- Central Avenue and Riverside Street
- Central and Tamarisk Avenues
- Central Avenue and Chamber Street
- Central and Sunland Avenues
- Central Avenue and Lynne Lane
- Central Avenue and Vineyard Road
- Central Avenue and Fremont Road/ Jesse Owens Parkway

Traffic Diversion

The MAG travel demand model, used as an input for this analysis, indicates that some of the traffic volumes on Central Avenue would divert to adjacent roadways as a result

of the Central Avenue lane reduction and travel mode shifts to light rail on Central Avenue. Because some traffic would move away from Central and 1st Avenues, the proposed Build Alternative would have no adverse impacts on intersections along Central or 1st Avenues. The diversion would result in a small increase in traffic volumes on adjacent roadways, especially 7th Street and 7th Avenue. Additionally, commuters may use local minor streets for shorter commutes. None of the intersections on 7th Street or 7th Avenue would operate at LOS F with implementation of the Build Alternative.

Build Alternative Impacts

According to the City of Phoenix intersection performance criteria, which compare Build Alternative LOS and delays with the No-Build Alternative, five intersections along 7th Street and 7th Avenue would operate at unacceptable conditions:

- 7th and Washington Streets (LOS would drop from LOS C to D with a greater than 5 percent increase in delay)
- 7th Street and I-17 traffic interchange (LOS would drop from LOS D to E with a greater than 5 percent increase in delay)
- 7th Avenue and I-17 traffic interchange (westbound ramps' LOS would remain at LOS E, but delay would increase by more than 5 percent; eastbound ramps' LOS would drop from LOS D to E with a greater than 5 percent increase in delay)
- 7th and Southern Avenues (LOS would drop from LOS D to E with a greater than 5 percent increase in delay)
- 7th Avenue and Baseline Road (LOS would drop from LOS C to D with a greater than 5 percent increase in delay)

Once the City of Phoenix applies signal optimization as part of its ongoing traffic signal maintenance program, the intersections at 7th and Washington Streets and 7th Avenue and Baseline Road would operate at acceptable levels. However, the following intersections would still be adversely affected as a result of the Build Alternative:

- 7th Street and I-17 traffic interchange
- 7th Avenue and I-17 traffic interchange
- 7th and Southern Avenues

McKinley Street Loop

Currently, light rail trackwork (loop) exists on McKinley Street that allows for a turnaround from the northbound direction on Central Avenue to the southbound direction on 1st Avenue. With the South Central Light Rail Extension, an additional loop would be added to McKinley Street to allow the following train movements:

- Southbound on 1st Avenue to northbound on Central Avenue
- Southbound on 1st Avenue to southbound on Central Avenue
- Northbound on Central Avenue to northbound on 1st Avenue

McKinley Street/1st Avenue and McKinley Street/Central Avenue additional trackwork proposed with the Build Alternative would provide operational flexibility during special events and in case of track closures by allowing the train to switch tracks.

At McKinley Street/1st Avenue, the southbound train movement to McKinley Street would operate with the southbound 1st Avenue traffic through movement phase. No change is needed at this signal. At McKinley Street/Central Avenue, the northbound train movement from McKinley Street would operate with the northbound Central Avenue traffic through movement phase. This train movement is an infrequent movement and would not affect the traffic operations at McKinley Street/1st Avenue and McKinley Street/Central Avenue. The additional trackwork is not anticipated to affect any current lane configurations.

3.6.3.2 Parking and Loading Zones

On-street Parking

Tables 3-14 and 3-15 summarize the number of existing parking spaces along and near the proposed light rail route and indicate the number of spaces that would be eliminated as a result of the proposed Build Alternative. The Build Alternative would remove three on-street parking spaces from the eastern side of 1st Avenue and two spaces from the western side of Central Avenue between Jefferson and Madison Streets. Existing parking spaces on Madison Street between 1st and Central Avenues would not be affected. Sixteen on-street parking spaces would be added to the northern side of Jefferson Street between Central and 1st Avenues with the Build Alternative. No other designated on-street parking spaces occur along the route.

**TABLE 3-14: ON-STREET PARKING INVENTORY
AND IMPACTS FOR NORTH-TO-SOUTH STREETS^a**

Street Segment	1st Ave Eastern Side		1st Ave Western Side		Central Ave Eastern Side		Central Ave Western Side	
	2015	Build	2015	Build	2015	Build	2015	Build
Jefferson St to Madison St	3	0	0	0	0	0	5	3

^a The No-Build Alternative would have the same number of parking spaces as the 2015 conditions.

Sources: Google Maps satellite images and Streetview, field check and South Central conceptual engineering plans dated March 2016

**TABLE 3-15: ON-STREET PARKING INVENTORY
AND IMPACTS FOR EAST-TO-WEST STREETS^a**

Street Segment	Madison Ave Northern Side		Madison Ave Southern Side		Jefferson St Northern Side		Jefferson St Southern Side	
	2015	Build	2015	Build	2015	Build	2015	Build
1st Ave to Central Ave	10	10	3	3	8	24	0	0

^a The No-Build Alternative would have the same number of parking spaces as the 2015 conditions.

Sources: Google Maps satellite images and Streetview, field check and South Central conceptual engineering plans dated March 2016

Although the Build Alternative would remove three on-street parking spaces on the eastern side of 1st Avenue between Jefferson and Madison Streets and two spaces from the western side of Central Avenue between Jefferson and Madison Streets, there is ample on-street and off-street parking along the alignment. For example, the building on the northeastern corner of 1st and Madison Avenues is a parking garage that could accommodate these lost spaces. Furthermore, the Build Alternative would create 16 additional on-street parking spaces that would not occur under 2015 conditions or the No-Build Alternative. No adverse impacts to on-street parking would occur; therefore, no mitigation is required.

Off-street Parking

Off-street parking for commercial businesses is prevalent along the South Central Light Rail Extension route. The following lists the locations and estimated parking losses where small partial ROW acquisitions for the Build Alternative would affect off-street parking:

- Eastern side of Central Avenue between Buckeye Road and Yuma Street (20 spaces)
- TPSS site northwest of Central Avenue and Cocopah Street (18 spaces)
- Northwestern corner of I-17 and Central Avenue (21 spaces)
- East and west of Central Avenue and Victory Street (16 spaces)
- East of Central Avenue between Riverside Street and Broadway Road (13 spaces)
- TPSS site southeast of Central Avenue and Fremont Road (10 spaces)
- Northwestern side of Central Avenue and Baseline Road (11 spaces)

Based on visual observations, ample parking is available in these off-street parking lots because of their general underutilization. Parking is also available in nearby parking lots or along unmarked curbside spaces on neighboring side streets. With this corridor having a higher level of transit-dependent residents and zero car and single car households, the Build Alternative provides a viable transportation alternative and would reduce the demand for parking. In summary, the proposed Build Alternative would have no adverse impacts on off-street parking.

Park-and-rides

The parking demand analysis completed as part of a park-and-ride study for the Build Alternative indicated that two park-and-ride facilities are needed to support ridership on the Build Alternative. Therefore, the Build Alternative would include construction of two new park-and-ride lots at the following locations:

- Central Avenue and Broadway Road
- Central Avenue and Baseline Road

The Central Avenue and Broadway Road park-and-ride would be on the northwestern corner, directly west of the Ed Pastor Transit Center on City of Phoenix-owned property. The park-and-ride would have 70 to 80 spaces.

The Central Avenue and Baseline Road park-and-ride would be west of Central Avenue and south of Fremont Road near the end-of-line light rail station at Baseline Road/Central Avenue. This park-and-ride could accommodate approximately 365 spaces.

The Build Alternative travel demand model projections used for the traffic analysis included vehicular trips from the two proposed park-and-ride locations. Therefore, no separate traffic assessment was conducted for these park-and-ride facilities, and no adverse impact is anticipated as a result of the proposed park-and-ride lots.

Loading Zones

The only loading zone that exists in the study area is on the eastern side of 1st Avenue between Jefferson and Madison Streets. The loading zone would be removed in conjunction with the Build Alternative. The loading zone is in front of a currently vacant building. The loading zone cannot accommodate most commercial delivery vehicles because its short 25-foot length could fit only a pickup-sized truck.

3.6.3.3 Pedestrians and Bicyclists

Pedestrians

The existing pedestrian facilities would be upgraded or maintained. Upgrades may include pedestrian ramps, sidewalks, pedestrian push buttons, crosswalks and other Americans with Disabilities Act-compliant provisions along 1st Avenue, Central Avenue and study intersections that would be affected by the proposed Build Alternative. Additionally, pedestrian signals would be added at all proposed signalized intersections near light rail stations. The actuated pedestrian signals and pedestrian push buttons at signalized intersections would benefit pedestrian traffic operations and safety along the South Central Light Rail Extension route. Therefore, the proposed Build Alternative would have no adverse impact on pedestrian facilities and would be beneficial to pedestrians using the improved facilities.

Bicyclists

The Build Alternative would retain the existing bicycle lanes and would add bicycle lanes in several locations where none currently exist to provide continuous bicycle facilities in both directions on 1st Avenue/Central Avenue from Madison Street to Baseline Road. To accomplish this would require new bicycle lanes at the following locations:

- Southbound on 1st Avenue between Madison and Lincoln Streets
- Southbound on Central Avenue between Riverside Street and Broadway Road
- Southbound and northbound (both directions) on Central Avenue between Southern Avenue and Baseline Road.

The addition of the bicycle lanes would support the City of Phoenix objective to incorporate bicycle lanes in all new projects to help achieve its goal of becoming a truly multimodal municipality.

The continuous striped bicycle facilities would be maintained as currently exists, with some reconfiguration. At some intersections, the bicycle lane would share ROW with the dedicated right-turn lane. This configuration would occur at the following intersections:

- Central Avenue and Buckeye Road (northbound and southbound directions)
- Central Avenue and Broadway Road (northbound and southbound directions)
- Central and Southern Avenues (northbound and southbound directions)
- Central Avenue and Lynne Lane (southbound direction only)
- Central Avenue and Baseline Road (southbound direction only)

The proposed reconfigurations of the bicycle lanes would have no adverse impact on bicyclists, and the additional bicycle lane along 1st Avenue would be beneficial to those desiring good riding facilities along that street.

3.6.3.4 Truck Routes

No impacts are anticipated for existing truck routes because none exist along the Build Alternative corridor. However, the arterial street system accommodates truck traffic related to commercial freight hauling to, from, through and within Phoenix. The planned roundabout intersections along Central Avenue have been designed to allow for truck turning movements. Business owners south of Audubon Center mentioned that trucks require access to and from Central Avenue for deliveries and related activities at the intersections of:

- Central Avenue and Pioneer Street
- Central Avenue and Victory Street

With the presence of light rail, a traditional signalized intersection would be unable to accommodate U-turn movements from large trucks (WB-67) entering or leaving unsignalized side streets along Central Avenue. To benefit the businesses south of the Salt River bridge and to accommodate WB-67 truck movements, roundabouts were proposed at Victory Street and north of the Audubon entrance.

WB-67 trucks exiting or entering side streets at unsignalized intersections along the alignment and near the Audubon entrance and Victory Street would be able to use these roundabouts to make U-turns.

The CWG, made up of members of the local community, also requested that traffic calming elements such as a roundabout be considered immediately south of the Salt River bridge near Pioneer Street to manage the speed of automobiles as they enter the South Mountain Village area and to serve as a community entrance feature. The proposed roundabout would serve as both a traffic calming element and a U-turn opportunity for truck traffic.

3.6.3.5 Transit

The differences in transit service between the Build and No-Build Alternatives include:

- Addition of the South Central Light Rail Extension.
- Elimination of the Central South Mountain East and West RAPID routes because of duplicative service with the new light rail extension.
- Addition of Route 77B to supplement the existing Route 77 service. Both Routes 77 and 77B would operate to and from the South Central Light Rail Extension end-of-line station at Baseline Road/Central Avenue to existing park-and-ride facilities at 27th Avenue and Baseline Road and at 24th Street and Western Canal. Like Route 77, Route 77B would have 30-minute peak/off-peak headways, which would improve total headways between the park-and-rides and the light rail end-of-line station to 15-minute peak/off-peak headways.
- Decrease in headways for Route 0 (Central Avenue) from 10 minutes/20 minutes (peak/off-peak) for the No-Build Alternative to 20 minutes/30 minutes (peak/off-peak) for the Build Alternative.

In summary, the proposed Build Alternative would have no adverse impact on transit. Travel times through the South Central corridor are likely to be faster than the No-Build Alternative because of implementation of priority signaling for light rail. The Build Alternative would provide a new, convenient and reliable transit option for passengers living and working in the South Central Light Rail Extension study area and would enhance regional transit connectivity and access.

3.6.3.6 Operations and Maintenance Center Expansion

Valley Metro plans to expand the existing OMC, east of Phoenix Sky Harbor International Airport and southwest of the intersection of the Grand Canal and Loop 202. The existing facility has access for trains at Washington Street and automobile traffic at 48th Street. Valley Metro has identified modifications needed for the OMC expansion to accommodate added light rail vehicles. Modifications include expanding the MOE building, adding storage track capacity and constructing a second cleaning platform.

The proposed expansion would occur within the facility's existing facilities footprint. The expansion would add office spaces and increase the light rail vehicle storage space to accommodate up to 105 total vehicles at the facility. All revenue-service trains depart the OMC before 7 a.m., and no trains return to the OMC during peak hours in current operations. Similar operation is anticipated for the added trains.

Trains would enter or exit the OMC facility during off-peak hours, when traffic volumes on Washington Street are lower compared with the peak hour. Therefore, the OMC improvements would have no adverse impact on the local transportation system.

3.6.4 Mitigation

Based on the City of Phoenix acceptable intersection performance criteria for the Build Alternative scenario, described in Section 3.6.3.1, the study intersections on 7th Street and 7th Avenue listed in Table 3-16 and shown in Figure 3-5 would require mitigation. The mitigation measures presented in the table would bring the intersection to the same LOS as with the No-Build Alternative. Refer to Table 3-16 for LOS results with mitigation.

The short loading zone on 1st Avenue that would be removed as a result of the Build Alternative would not need to be replaced since sufficient capacity exists in the alley adjacent to the building affected by the lost loading zone to accommodate daily loading/unloading abilities. In summary, the proposed Build Alternative would have no adverse impacts on loading zones.

No other mitigation is needed because the Build Alternative would have no adverse impact on pedestrians, bicycle facilities or transit.

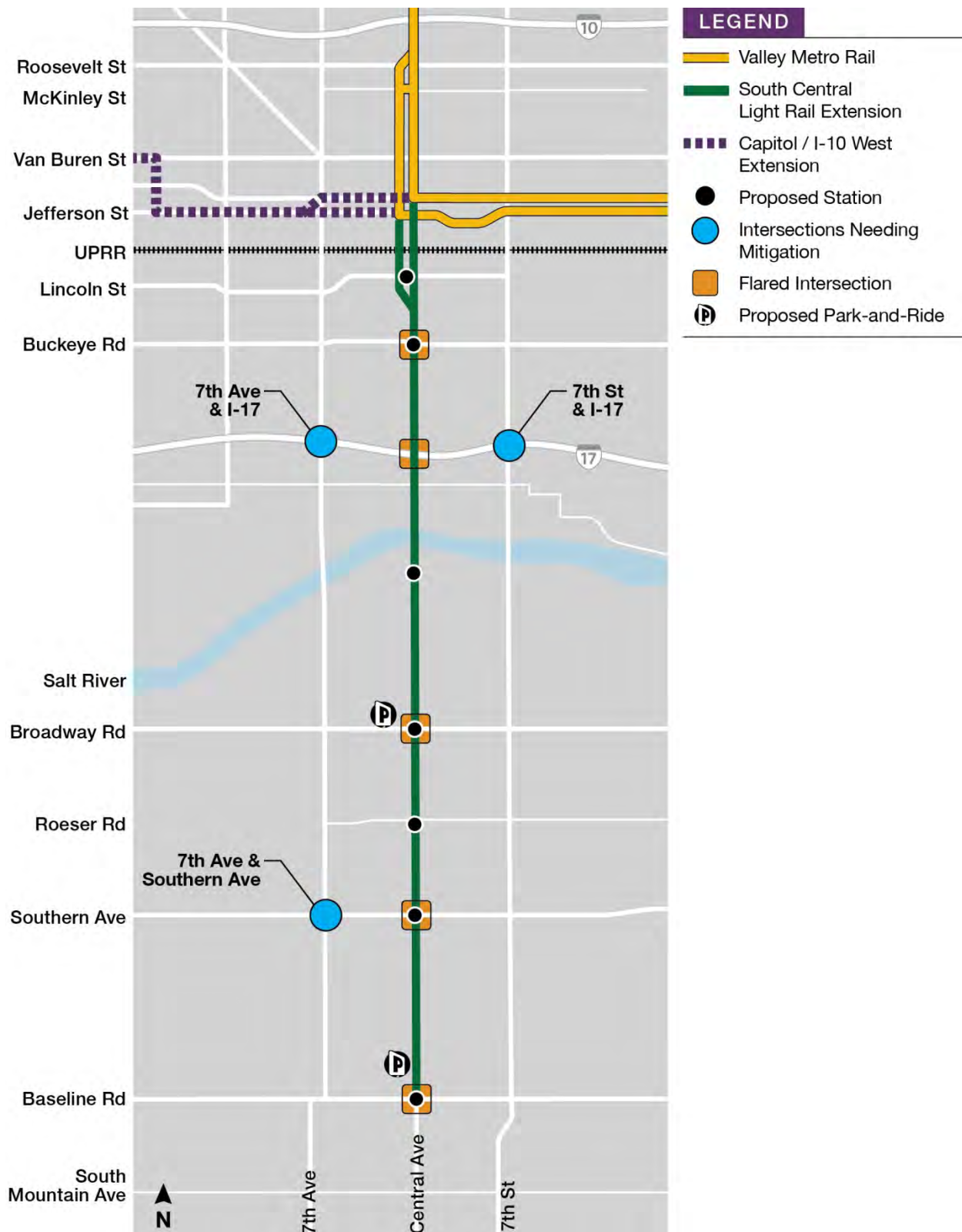
TABLE 3-16: STUDY INTERSECTIONS – MITIGATION

Intersection	Proposed Mitigation	Build without Mitigation		Build with Mitigation	
		Delay (seconds)	LOS	Delay (seconds)	LOS
7th St and Interstate 17	Add a northbound right-turn lane in addition to existing through shared right lane, restripe eastbound through right as exclusive right and optimize signal timing.	WB ramps: 75	E	WB ramps: 52	D
		EB ramps: 80	E	EB ramps: 46	D
7th Ave and Interstate 17 ^a	Add a northbound right-turn lane, southbound right-turn lane and optimize signal timing	WB ramps: 70	E	WB ramps: 54	D
		EB ramps: 65	E	EB ramps: 53	D
7th Ave and Southern Ave	Add a westbound right-turn lane, southbound right-turn lane and optimize signal timing.	68	E	54	D

Notes: EB = eastbound, LOS = level of service, WB = westbound

^a Additional right-of-way would be needed at this intersection to accommodate the southbound right-turn lane.

FIGURE 3-5: INTERSECTIONS NEEDING MITIGATION



3.7 AIR QUALITY AND GREENHOUSE GASES

This section summarizes detailed information regarding air quality included in Appendix D, *Air Quality Technical Report*, and provides additional information related to greenhouse gases (GHGs) and mobile source air toxics (MSATs).

3.7.1 Environmental Setting

The U.S. Environmental Protection Agency (EPA) has established the National Ambient Air Quality Standards (NAAQS) to protect public health and welfare (EPA 2015a). Primary standards protect public health, while secondary standards protect public welfare (such as protecting property and vegetation from the effects of a particular pollutant).

The six primary air pollutants of concern, or “criteria” pollutants as described by EPA, have NAAQS based on human health and/or environmental criteria. NAAQS have been established for 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 NAAQS have been adopted by the State of Arizona as the ambient air quality standards for the state.

3.7.1.1 Sensitive Receptors

Sensitive receptors are locations where the elderly, children or other groups with a greater susceptibility (than the general public) to adverse health effects congregate. These locations include schools, hospitals, convalescent homes, parks and daycare facilities.

The study area contains several parks and schools. Reyes Maria Ruiz Leadership Academy, Esperanza Montessori Academy, Phoenix Collegiate Academy and South Pointe Junior High School are adjacent to the Build Alternative. No parks are adjacent to the Build Alternative. No hospitals, daycare centers, convalescent homes or other such facilities are in the study area.

3.7.1.2 Primary Pollutants of Concern

This section describes the six primary pollutants of concern and the health issues identified for each. More detailed information on these pollutants can be found on EPA’s “Technology Transfer, National Ambient Air Quality Standards (NAAQS)” website (<https://www3.epa.gov/ttn/naaqs/>).

- CO is a colorless, odorless gas emitted from combustion processes. Nationally and, particularly in urban areas, most CO emissions to ambient air come from mobile sources. CO can cause harmful health effects by reducing oxygen delivery to the body’s organs (like the heart and brain) and tissues. At extremely high levels, CO can cause death.
- Ground-level or “bad” O₃ is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen and volatile organic compounds in the presence of sunlight. Breathing O₃ can trigger a variety of health problems,

particularly for children, the elderly and people of all ages who have lung diseases such as asthma. Ground-level O₃ can also have harmful effects on sensitive vegetation and ecosystems.

- Particulate matter, also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals and soil or dust particles. EPA is concerned about particles that are 10 microns in diameter or smaller because, once inhaled, these particles can affect the heart and lungs and cause serious health effects. EPA groups particle pollution into two categories:
 - o “Inhalable coarse particles,” such as those found near roadways and dusty industries, are larger than 2.5 microns and smaller than 10 microns in diameter.
 - o “Fine particles,” such as those found in smoke and haze, are 2.5 microns in diameter and smaller. These particles can form when gases emitted from power plants, industries and automobiles react in the air.
- SO₂ is one of a group of highly reactive gases known as “oxides of sulfur.” The largest sources of SO₂ emissions are from fossil fuel combustion at power plants (73 percent) and other industrial facilities (20 percent). Smaller sources of SO₂ emissions include vehicular emissions from highways and industrial processes. SO₂ is linked with a number of adverse effects on the respiratory system.
- NO₂ is one of a group of highly reactive gases known as “oxides of nitrogen,” or “nitrogen oxides.” NO₂ forms quickly from emissions from cars, trucks, buses, power plants and off-road equipment. In addition to contributing to the formation of ground-level O₃ and fine particle pollution, NO₂ is linked with a number of adverse effects on the respiratory system.
- Pb is a metal found naturally in the environment as well as in manufactured products. Once taken into the body, lead distributes throughout the body in the blood and is accumulated in the bones. Depending on the level of exposure, lead can adversely affect the nervous system, kidney function, immune system, reproductive and developmental systems and the cardiovascular system. Lead exposure also affects the oxygen-carrying capacity of blood.

3.7.1.3 Attainment Status for Criteria Pollutants

Geographic areas in which the ambient concentrations of a pollutant exceed the NAAQS are classified as nonattainment areas. Federal regulations require States to prepare statewide air quality planning documents called State Implementation Plans (SIPs) that establish methods to bring air quality in nonattainment areas into compliance with the NAAQS and to maintain compliance. Nonattainment areas that return to compliance are called maintenance areas. These measures also help ensure that transportation plans and other transportation projects conform to the SIP.

Maricopa County is currently designated as a nonattainment area for 8-hour O₃ and PM₁₀ and as a maintenance area for CO. SIP provisions for the nonattainment areas have been included in the SIP and modeled regionally by MAG. The County is also designated as unclassifiable/attainment for SO₂, Pb, NO₂ and PM_{2.5}.

3.7.1.4 Mobile Source Air Toxics

In addition to the NAAQS, EPA has developed a list of 21 MSATs that result from industrial activities, motor vehicle emissions and nonroad equipment and that are associated with numerous adverse health effects. Examples of MSATs are benzene, formaldehyde, naphthalene and diesel particulate matter. Research has shown that people exposed to MSATs at sufficiently high concentrations or for extended periods of time may have an increased risk of certain health effects, including cancer, compromised immune systems or neurological problems.

To date, no federal standards have been adopted for MSAT emissions. Since 2007, EPA has implemented several mobile source emission control programs that, in addition to controlling pollutants such as hydrocarbons, particulate matter and nitrogen oxides, will also result in large air toxic reductions. For example, EPA has instituted rules for lowering the benzene content of gasoline that will reduce other MSAT emissions as well and by requiring reductions in vehicle emissions (EPA 2016).

3.7.1.5 Greenhouse Gases

Climate change is an important national and global concern, and there is general agreement that the earth's climate is currently changing at an accelerated rate and will continue to do so for the foreseeable future. Human-caused GHG emissions contribute to this rapid change, with carbon dioxide (CO₂) being the largest component of GHG emissions. The transportation sector is the second-largest source of total GHGs in the United States and the largest source of carbon dioxide (CO₂) emissions, the predominant GHG. In 2009, the transportation sector was responsible for 27 percent of all CO₂ emissions produced in the United States (EPA 2015). To date, no national standards have been established for GHGs and because climate change is a global issue and the emission changes due to the proposed action would be very small compared to global totals, GHG 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 GHG emissions.

One of the key contributors to high GHG emissions is the rising transportation demand from the daily influx of people to Downtown Phoenix for its employment, educational facilities and entertainment and cultural attractions. With over 48,000 employees, Downtown Phoenix is the highest-density employment center in the region. The growth of ASU's Downtown Campus, with a current enrollment of over 11,000, has further fueled travel demand to Downtown Phoenix. With the increased density and infill development projected for Downtown Phoenix, the City has identified the provision of high quality transit service as a primary strategy to ease congestion and reduce GHG emissions. The City's comprehensive transportation plan, *Transportation 2050*, was approved by voters in August 2015 and will triple the current mileage of light rail service in Phoenix, increase bus frequency by 70 percent, and increase transit hours of operation by 20 percent.

FTA and the Federal Highway Administration (FHWA) are also working with other agencies in the U.S. Department of Transportation (USDOT) Center for Climate Change and Environmental Forecasting to develop strategies to reduce transportation's contribution to GHGs—particularly CO₂ emissions—and to assess the risks to

transportation systems and services from climate changes. In 2008, the Phoenix City Council adopted a goal to reduce GHG emissions from city operations 5 percent below the 2005 levels by 2015. The following year, the City released a *Climate Action Plan* that identified specific measures grouped by sector (energy efficiency and renewable energy, transportation, and solid waste) that would be implemented to successfully reduce GHG emissions. With the publication of the *Greenhouse Gas Emissions Reduction Report* in 2012, the City announced that it had surpassed its initial goal by reducing GHG emissions by 7.2 percent—three years ahead of schedule. As a result of this success, the City Council adopted a new goal in 2014 to reduce GHG emissions from city operations 15 percent below the 2005 levels by 2015. Additionally, the City Council gave approval for the City to coordinate with regional stakeholders to develop a regional GHG emissions inventory that would include residential, commercial, and industrial sources as well as city operations.

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 GHG emissions to the level of the Build Alternative. The No-Build Alternative is not as supportive of the City of Phoenix's GHG reduction strategies by providing alternative modes of transportation, as formally laid out in *Transportation 2050*, *Climate Action Plan* and *Greenhouse Gas Emissions Reduction Report*.

3.7.3 Build Alternative

3.7.3.1 Air Quality

The Clean Air Act mandates that federal agencies and metropolitan planning organizations not approve any transportation project, program or plan that does not conform to the approved 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. Under Section 176(c) of the Clean Air Act, a transportation project is said to conform to the provisions and purposes of the SIP if the project, both alone and in combination with other planned projects, does not:

- Cause or contribute to new air quality violations of the NAAQS,
- Worsen existing violations of the NAAQS, or
- Delay timely attainment of the NAAQS or required interim milestones.

On March 9, 2005, EPA redesignated the Phoenix metropolitan area from nonattainment to attainment for the CO NAAQS and approved the State's plan for maintaining the CO NAAQS for 10 years. On October 19, 2015, EPA approved a second maintenance plan for maintaining the CO NAAQS for an additional 10 years and

approved a transportation conformity motor vehicle emissions budget for 2035 and beyond.

Approval of the second maintenance plan for maintaining the CO NAAQS for an additional 10 years has no effect on the CO evaluation prepared for this study.

Regional Conformity Demonstration

Regional conformity analyses are prepared by the appropriate metropolitan planning organization (in this case, MAG for Maricopa County) as part of the conformity determinations of the transportation plans and transportation improvement programs.

In June 2015, the MAG Regional Council approved the air quality conformity analysis for the Fiscal Year (FY) 2014–2018 MAG Transportation Improvement Program (TIP) and 2035 RTP, as amended. The Build Alternative was included in the amendment for 2035. On July 9, 2015, FHWA and FTA made a Finding of Conformity on the amended TIP and 2035 RTP.

The 2015 conformity analysis demonstrated that the regionally significant transportation projects included in the evaluation would conform to the CO and PM₁₀ emission budgets established in the SIP for each pollutant and will not cause or contribute to new air quality violations, increase the frequency or severity of any existing violation of any standard in any area or delay timely attainment of any standard or any required interim emission reductions or other milestones.

MAG will be completing a new air quality conformity analysis in May 2016 to include the current Build Alternative's revised opening year of 2023. The Build Alternative's new opening year will be included in an amended TIP and 2035 RTP that will be adopted by the MAG Regional Council on June 2016. FTA and FHWA federal approval is anticipated to occur in July 2016.

Project-level Carbon Monoxide Screening (Hot-spot Analysis)

To comply with air quality conformity requirements in nonattainment or maintenance areas for CO, a hot-spot analysis is required. EPA guidance for modeling CO was issued in 1992 (EPA 1992). 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 hot-spot analysis was conducted in accordance with EPA guidelines (Section 3.7.1) for five intersections in the study area in terms of the worst LOS and the highest traffic volumes. A total of 34 intersections in the study area were reviewed. The five intersections selected for modeling the CO concentrations are presented in Table 3-17. Project-level modeling is used to predict CO concentration resulting from emissions from motor vehicles using roadways immediately adjacent to the location at which predictions are being made. As shown in Table 3-17, the highest modeled CO concentrations at all five intersections would be below the 1- and 8-hour NAAQS in all analysis years. Therefore, no localized CO impacts would result from the proposed Build Alternative.

TABLE 3-17: HIGHEST MODELED CO CONCENTRATIONS (PPM)

Intersection	2015 Conditions		No-Build		Build	
	1-hour ^a	8-hour ^{b,c}	1-hour ^d	8-hour ^{e,f}	1-hour ^d	8-hour ^{e,f}
Central Ave and Baseline Rd	5.3	3.9	5.7	4.2	5.7	4.2
7th St and Baseline Rd	5.2	3.8	5.7	4.2	5.7	4.2
7th St and Buckeye Rd	5.2	3.8	5.6	4.2	5.6	4.2
7th Ave and Broadway Rd	5.2	3.8	5.6	4.2	5.6	4.2
Central Ave and Southern Ave	5.3	3.9	5.6	4.2	5.6	4.2

Notes: CO = carbon monoxide, ppm = parts per million

The 1-hour National Ambient Air Quality Standard is 35 ppm, and the 8-hour is 9 ppm.

^a Includes 1-hour background concentration of 4.3 ppm.

^b Includes 8-hour background concentration of 3.2 ppm.

^c 8-hour concentrations calculated using persistence factor of 0.7 applied to the 1-hour results.

^d Includes 1-hour background concentration of 5.5 ppm in 2035.

^e Includes 8-hour background concentration of 4.1 ppm in 2035.

^f 8-hour concentrations in 2035 calculated using persistence factor of 0.7 applied to the 1-hour results.

Both the regional and hot-spot analyses comply with the Federal Transportation Rule and indicate that the proposed Build Alternative would 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.

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. 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/liquefied natural gas and diesel-electric hybrids. (August 18, 2011, email from Jason Hartong, City of Tempe, to Robert Forrest, Valley Metro Rail—see Appendix D).
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 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 light rail vehicles that contribute to diesel particulate matter. Therefore, no MSAT analysis is necessary.

3.7.3.2 Greenhouse Gas Emissions

Because climate change is a global issue and the emission changes attributable to the proposed Build Alternative would be very small compared with regional and global emissions, GHG emissions were estimated based on the total VMT in Maricopa County in 2015 and 2035 and on how those estimates are likely to affect GHG emissions.

EPA's MOVES2014 model can be used to estimate vehicle exhaust emissions of CO₂ and other GHGs. CO₂ is frequently used as an indicator of overall transportation GHG emissions because the quantity of these emissions is much larger than that of all other transportation GHGs combined and because CO₂ accounts for 90 to 95 percent of the overall climate impact from transportation sources.

Table 3-18 shows the annual CO₂ emissions and VMT in Maricopa County in 2015 and 2035, as derived from the MOVES2014 model.

**TABLE 3-18: PROJECTED VEHICLE MILES TRAVELED
AND CO₂ EMISSIONS IN MARICOPA COUNTY, ARIZONA**

Miles Traveled (billions)			CO ₂ (million tons)		
2015	2035	% Change	2015	2035	% Change
3.3	4.1	+24.2	1.97	1.70	-13.7

Source: MOVES2014

Notes: CO₂ = carbon dioxide

National default parameters for Maricopa County (2015 and 2035); all road types, all vehicle types, all fuel types

As shown in Table 3-18, annual CO₂ emissions in Maricopa County are projected to decrease by nearly 14 percent between 2015 and 2035 despite a projected 24 percent increase in miles traveled over the same time frame. The Build Alternative corridor is about 5 miles long, and the annual VMT in this corridor would be a very small proportion of county-wide VMT. The GHG emissions associated with the proposed Build Alternative would be a very small proportion of county-wide GHG emissions. In addition, the City of Phoenix has adopted aggressive plans, policies and strategies to reduce GHG emissions by providing transportation choices other than single-occupant vehicle travel modes, as discussed in Section 3.7.2. The Build Alternative supports the City's published GHG reduction plans and strategies because it would provide a transit travel option that does not exist in this area of Phoenix. Implementation of the Build Alternative and related streetscape improvements would provide additional modes of transportation in the study area that would support national, regional and City of Phoenix efforts to reduce GHG and VMT.

In conjunction with the Build Alternative, Valley Metro plans to expand the existing OMC. Expanding the facility would include constructing additional trackwork for train storage, expanding the cleaning platform and expanding the MOE building. Additional automobile trips to and from the OMC as a result of a few additional employees would occur in off-peak hours and would not contribute to a reduction in air quality. There would be no air quality or GHG impacts beyond those described for the proposed Build Alternative.

3.7.4 Mitigation

The air quality analyses conducted for the proposed Build Alternative show that the Build Alternative would not cause an exceedance of the NAAQS for applicable transportation-related criteria pollutants.

GHG emissions would decrease by nearly 14 percent in 2035 despite a 24 percent increase in VMT in 2035.

Because the proposed Build Alternative would not cause violations of existing air quality standards, no mitigation measures are proposed. In summary, the Build Alternative would have no adverse impacts on air quality or adversely contribute to GHG emissions.

3.8 NOISE AND VIBRATION

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

Noise and vibration measurements were performed at multiple sites along the proposed light rail alignment. Figures 3-6 to 3-9 show the noise and vibration test sites and the sensitive land uses and receptor locations evaluated. Details of the measurement findings are discussed in this section.

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. The term "Leq" is known as the equivalent sound level. It describes a person's cumulative exposure to all sound occurring over a certain period (for example, 1 hour or 24 hours). Leq differs from "Lmax," which describes the maximum sound level derived from one sound, such as an airplane flying overhead.

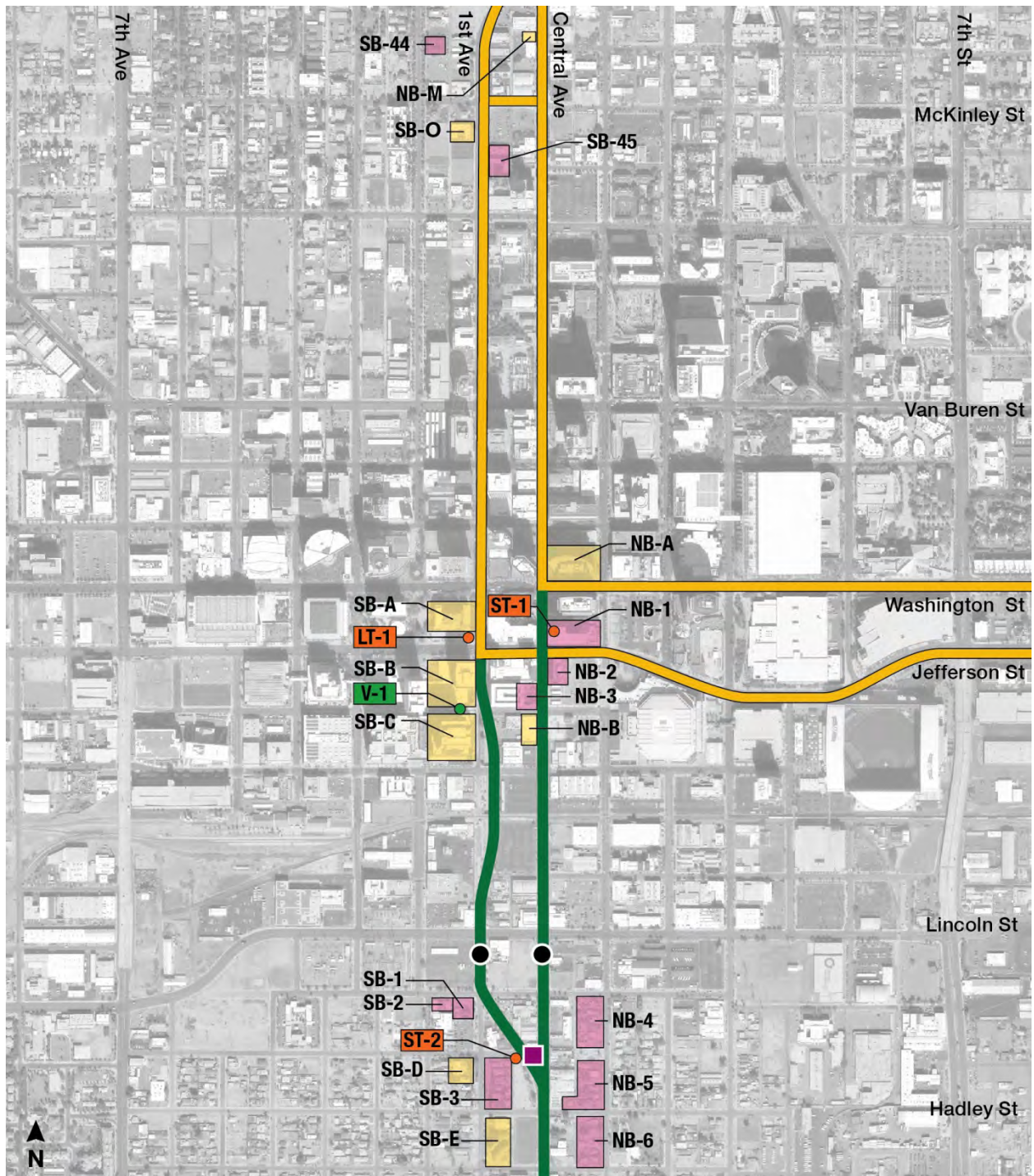
In an urban setting, a change of 1 dBA or less is generally not detectable by the human ear, while a change of 3 dBA is noticeable to most people. A change of 5 dBA is readily perceived. A change of 10 dBA, up or down, is typically perceived as a doubling or halving of an urban noise level, respectively.

3.8.1.1 Noise

The FTA noise impact analysis is based on 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 light rail would traverse. Secondary transportation noise sources include light rail, freight rail and airplanes. FTA's noise guidelines define three land use categories that govern which noise metric should be used and that establish the threshold for impacts:

- **Category 1** is reserved for land where quiet is an essential element of the land's intended purpose. No Category 1 land uses exist along the South Central Light Rail Extension route.
- **Category 2** includes residences, hospitals and hotels where nighttime sensitivity to noise is important. Land uses that fall into this category along the light rail route include single-family and multifamily residences and hotels.
- **Category 3** includes institutional land uses with mostly daytime use. Category 3 land uses along the route include schools, churches, courthouses, libraries, funeral homes, medical facilities and a habitat restoration area that is also used for recreational activities.

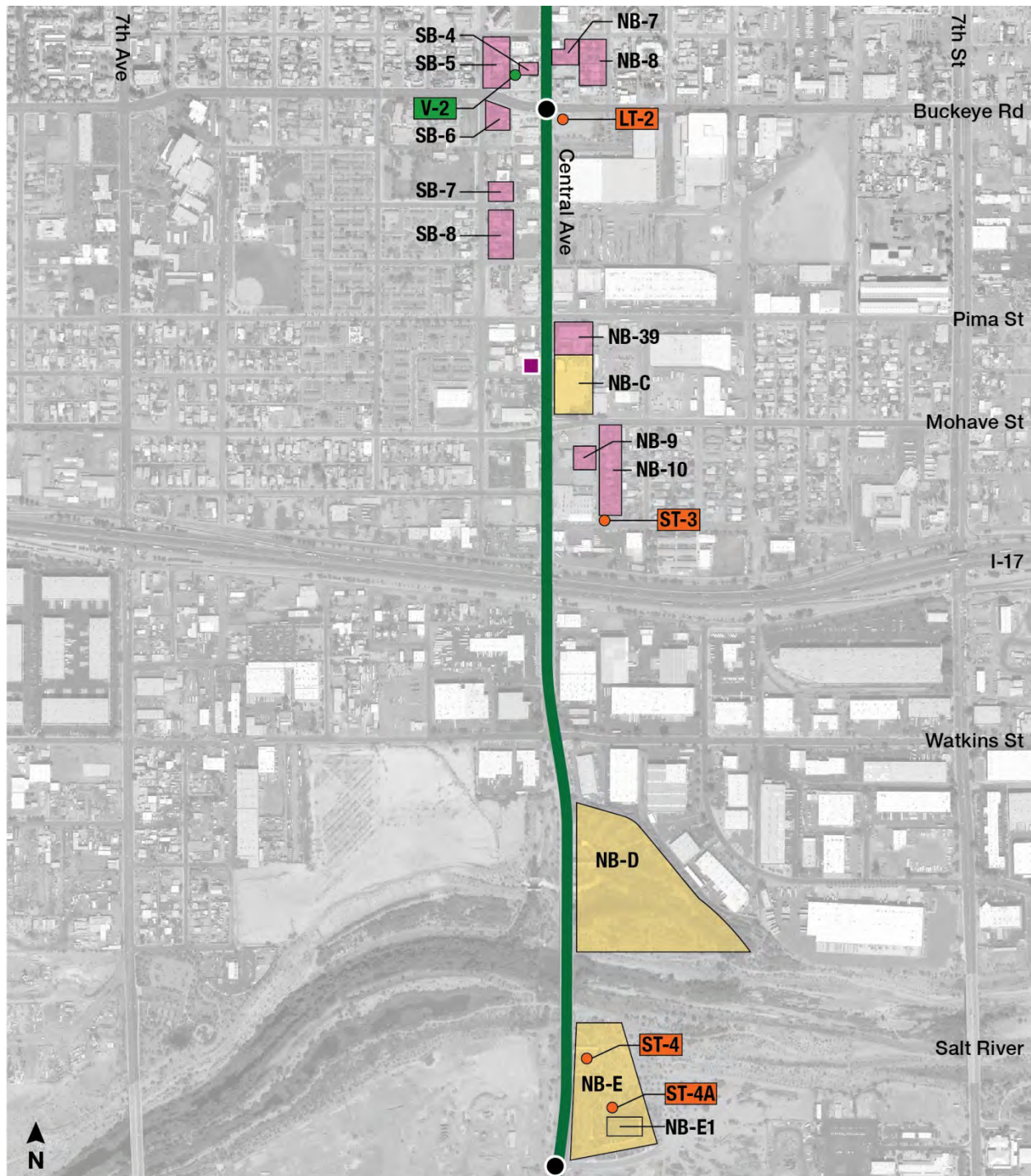
**FIGURE 3-6: NOISE AND VIBRATION TEST SITES
AND SENSITIVE RECEIVERS – DOWNTOWN**



LEGEND

 Valley Metro Rail	 Potential Park-and-Ride	 Residential Land Use (FTA Category 2)	 Noise Test Site
 South Central Light Rail Extension	 Potential TPSS	 Institutional Land Use (FTA Category 3)	 Vibration Test Site
 Proposed Station			

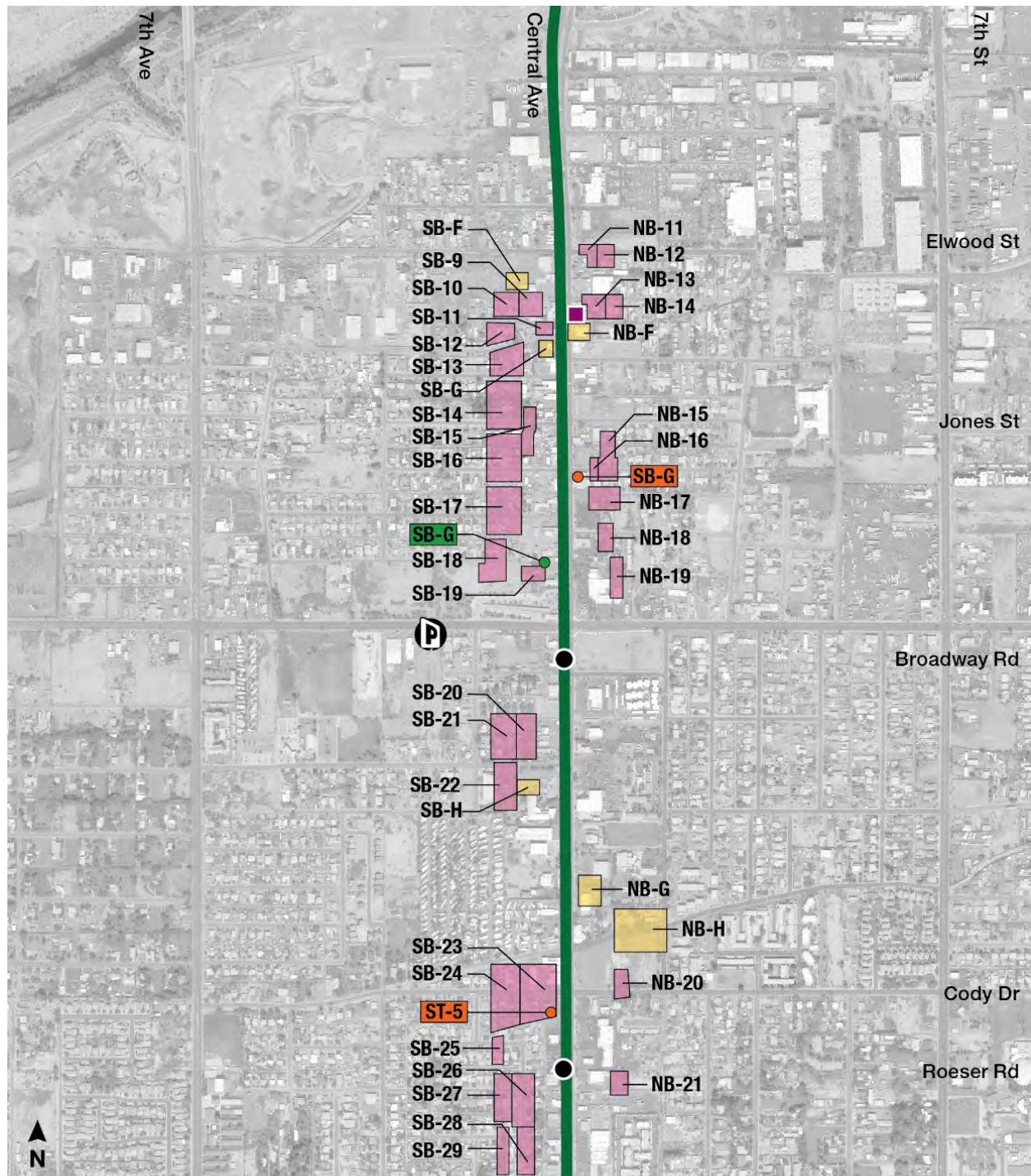
**FIGURE 3-7: NOISE AND VIBRATION TEST SITES
AND SENSITIVE RECEIVERS – BUCKEYE ROAD TO SALT RIVER**



LEGEND

 Valley Metro Rail	 Potential Park-and-Ride	 Residential Land Use (FTA Category 2)	 Noise Test Site
 South Central Light Rail Extension	 Potential TPSS	 Institutional Land Use (FTA Category 3)	 Vibration Test Site
 Proposed Station			

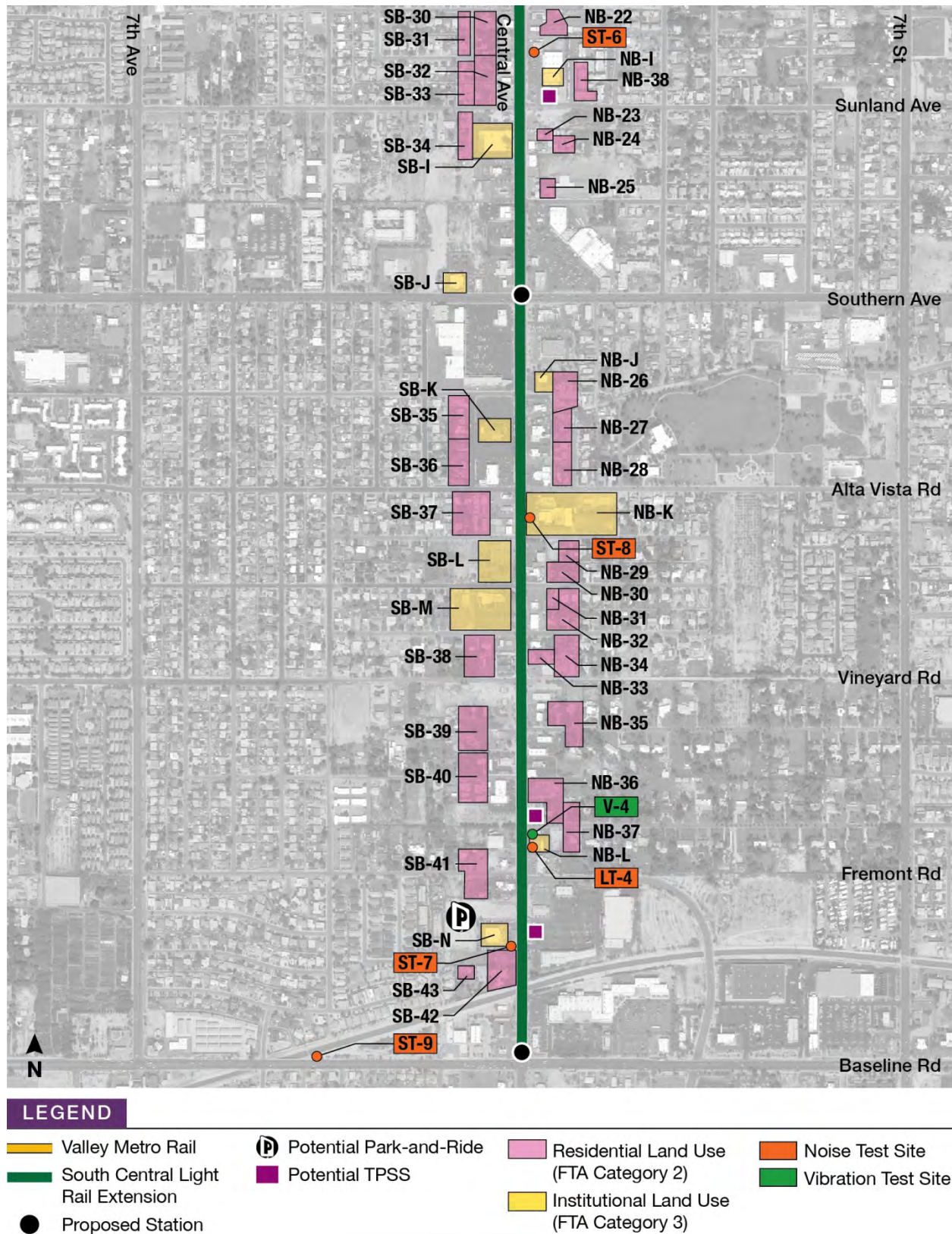
**FIGURE 3-8: NOISE AND VIBRATION TEST SITES
AND SENSITIVE RECEIVERS – ELWOOD STREET TO ROESER ROAD**



LEGEND

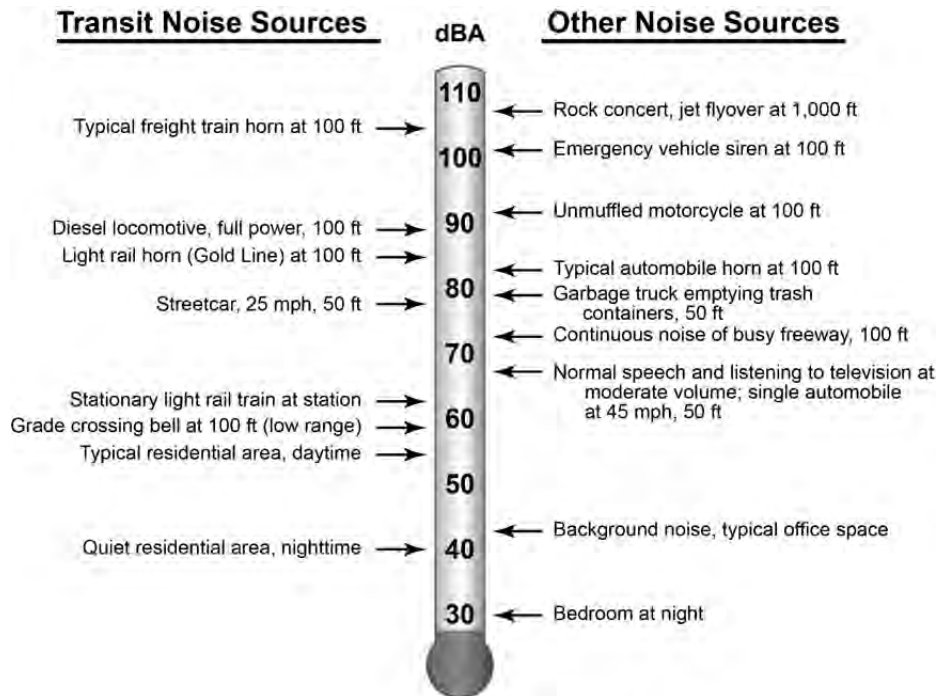
 Valley Metro Rail	 Potential Park-and-Ride	 Residential Land Use (FTA Category 2)	 Noise Test Site
 South Central Light Rail Extension	 Potential TPSS	 Institutional Land Use (FTA Category 3)	 Vibration Test Site
 Proposed Station			

**FIGURE 3-9: NOISE AND VIBRATION TEST SITES
AND SENSITIVE RECEIVERS – SUNLAND AVENUE TO BASELINE ROAD**



Noise measurements were performed at four long-term sites for a period of 24 hours and at 10 short-term sites for durations ranging from 20 minutes to 1 hour. The daytime noise levels varied from 57 to 74 dBA Leq. Figure 3-10 provides a point of reference by illustrating typical noise levels from various sources. Refer to Appendix E for a more detailed explanation of the results.

FIGURE 3-10: TYPICAL NOISE LEVELS



Sources: Federal Transit Administration (2006) and ATS Consultants, 2015 data

3.8.1.2 Vibration

Potential adverse effects of light rail 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. When vehicular traffic causes perceptible vibration, the source usually is traced to potholes, wide expansion joints or other “bumps” in the roadway surface.

Existing vibration levels were measured at ten representative locations (ST-1, ST-2, ST-4 through ST-7 and V-1 through V-4), shown in Figures 3-6 to 3-9. The existing measurements were used to characterize vibration levels from buses, light rail and freight train pass-bys in the Build Alternative area.

The land use categories for vibration evaluation are defined somewhat differently from the categories for noise evaluation. No FTA Category 1 (highly sensitive) land uses for groundborne vibration exist along the Build Alternative corridor. Typical Category 1 land uses include vibration-sensitive research and manufacturing facilities, hospitals with vibration-sensitive equipment and university research operations. Category 2 uses in the corridor include, but are not limited to, houses, apartments, condominiums, hotels

and the Salvation Army Adult Rehabilitation Center residences. Category 3 uses include several schools and churches, two courthouses, two funeral homes and several medical facilities. FTA (2006) identifies “special buildings” for vibration impact evaluation that fall outside land use Categories 1, 2 and 3. Such buildings include theaters, auditoriums, recording studios, television studios and concert halls. No special buildings were identified along the South Central Light Rail Extension route.

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 were based on the distance from the proposed Build Alternative to the closest sensitive receiver.
2. **Determine 2015 conditions.** As previously described, existing noise levels were measured along the Build Alternative corridor at four long-term sites for 24 hours and at 10 short-term sites for 20 minutes to 1 hour. The measurements were used to estimate the existing Ldn (day-night equivalent level, which is the A-weighted Leq sound level measured over a 24-hour period with a 10-dB penalty added to levels between 10 p.m. and 7 a.m.) and the daytime Leq at all sensitive receiver clusters.
3. **Develop prediction models.** The noise prediction models were based on formulas provided by FTA (2006) and measurements of noise produced by the existing Valley Metro light rail line. The predictions of light rail noise were based on the forecast future number of daily light rail trains; the distribution of trains throughout the day; the distance from the tracks; the light rail vehicle operating speed; the presence of walls, berms or other structures that reduce noise levels and other site-specific conditions. The predictions also included noise from train bells at stations and signalized intersections, crossing gate bells, vehicles using the proposed park-and-ride facilities and TPSS units. A model was also developed to perform separate predictions of noise from TPSS units to compare noise levels with nighttime noise near residential receivers. The light rail vehicles would operate in a semiexclusive ROW adjacent to vehicular traffic, and the proposed Build Alternative would result in minimal changes in traffic volumes and traffic patterns—except for short segments at some intersections—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 those intersections along the alignment where the roadway configuration would change, potentially bringing the roadway closer to sensitive receptors than under 2015 conditions or No-Build Alternative conditions. Road traffic noise for these locations was analyzed using FHWA’s Traffic Noise Model. For those analyses, each lane was modeled as a separate Traffic Noise Model roadway object for the most precise noise source placement possible. Predicted Build and No-Build traffic volumes and posted speeds were applied. In addition, bus schedules and planned bus service changes resulting from the Build Alternative for peak hour operations were included in the model.

4. **Estimate future noise levels at the representative receivers.** The models were used to predict noise levels from light rail operations at all clusters of sensitive receivers in the corridor. The predictions were compared with applicable FTA impact thresholds to identify potential noise impacts. FTA considers a noise level to be an impact if the project equals or exceeds the impact threshold, and it provides two levels of noise impact: moderate and severe (FTA 2006). FTA determines the noise limit by comparing predicted future project noise with existing noise levels. 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 would adversely affect a large percentage of the population, it is considered severe. The FTA noise impact criteria in tabular format are presented in Table 3-19, with the thresholds rounded to the nearest decibel. For TPSSs, the criteria used for this Build Alternative to determine impacts were more stringent than the FTA criteria.² 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 dB. 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 would exceed FTA's impact thresholds.

TABLE 3-19: FEDERAL TRANSIT ADMINISTRATION NOISE IMPACT CRITERIA

Existing Noise Exposure, Leq or Ldn	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
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

² If a sound is more than 5 dB lower than background noise, it will add less than 1 dB to the background noise. Generally, people cannot perceive a 1-dB change. Basing the criteria on the nighttime Leq helps to ensure that the TPSSs would not interfere with sleep.

Existing Noise Exposure, Leq or Ldn	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
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: Federal Transit Administration (2006)

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

dBA = A-weighted decibel, Ldn = day-night equivalent sound level, Leq = equivalent sound level

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 were based on force density level measurements made on Valley Metro's Starter Line by ATS Consulting in 2009 and on vibration propagation tests at representative sites along the South Central Light Rail Extension corridor, spaced approximately 2 miles apart or less. Vibration propagation was measured at Sites V-1 through V-4, shown in Figures 3-6 to 3-9. The vibration prediction models were based on FTA's detailed vibration assessment methodology (2006).
- 3. Estimate future vibration levels at representative receivers.** The models were used to predict vibration levels from light rail operations at all sensitive receivers in

the Build Alternative corridor. The predictions were compared with FTA impact thresholds as defined in FTA's Vibration Impact Methodology (2006) to identify potential vibration impacts. Vibration levels cannot exceed impact thresholds of 72 vibration decibels (VdB) for residential and 78 VdB for institutional uses.

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 as other transportation projects, previously discussed in Chapter 2.0, are implemented. However, traffic volumes would need to double by 2023 for noise levels to increase by 3 dB, 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 describe potential Build Alternative noise and vibration impacts.

3.8.3.1 Noise

This subsection summarizes the noise impact assessment of the proposed Build Alternative.

The following is a summary of the noise impact assessment of the proposed Build Alternative. Noise-sensitive land uses and locations of potential impacts were presented previously in Figures 3-6 to 3-9.

- **Category 1:** No Category 1 (highly sensitive) land uses are located along the Build Alternative alignment. Therefore, the proposed Build Alternative would have no noise impacts on such land uses.
- **Category 2:** Several moderate impacts and one severe impact would result from light rail operations at Category 2 land uses (residential or other sensitive receivers with both daytime and nighttime use, for example, residences, hotels, motels), as shown in Table 3-20. The moderate impacts would occur at 11 sensitive receiver clusters that consist of 52 single-family residences. The moderate impacts are all less than 1 dB, with the exception of one receiver—receiver cluster SB-42, two homes on the southbound side (western side of Central Avenue) just north of the Western Canal. The noise levels at these two houses would be 3 dB above FTA's threshold for moderate impact. Each of these moderate impacts is either near tracks with special trackwork or near a train station where train bells are sounded (or both). The severe impact would occur at a cluster of two single-family homes near tracks with special trackwork and near a TPSS unit (receiver cluster NB-13, northbound side [east side of Central Avenue] near the intersection of Central Avenue and Raymond Street).
- **Category 3:** No noise impacts are predicted to result from light rail operations at Category 3 land uses (institutional with primarily daytime use), as shown in Table 3-21.

TABLE 3-20: SUMMARY OF NOISE IMPACT ASSESSMENT FOR CATEGORY 2

ID ^a	Desc. ^b	Near Track Dist. (feet)	Sensitive Receiver Location	Speed (mph)	Exist. Noise Site	Ldn ^c (dBA)				# of Impacts ^d	
						2015	Build	Impact Threshold			
								Mod.	Severe	Mod.	Severe
NB-01	HT	17	Hotel Palomar Phoenix	25	LT-1	70	61 ^{LX}	65	70	—	—
NB-02	MF	21	Barrister Place (potential multiuse redevelopment with residential component)	25	LT-1	70	63 ^{LX}	65	70	—	—
NB-03	HT	43	Luhrs (Tower) City Center Marriott (under construction)	25	LT-1	67	56 ^{LX}	62	67	—	—
NB-04	SF	198	700–722 S 1st St	30	LT-2	60	56 ^{X, TB}	58	63	—	—
NB-05	SF	148	734–800 S 1st St and 12 E Hadley St	30	LT-2	59	50 ^X	57	63	—	—
NB-06	SF	208	900–922 S 1st St	30	LT-2	60	51	58	63	—	—
NB-07	SF	54	1001–1009 S Central Ave	30	LT-2	70	60 ^{TB}	64	69	—	—
NB-08	SF	210	1000–1022 S 1st St	30	LT-2	60	54 ^{TB}	58	63	—	—
NB-09	SF	181	1706–1712 S 1st St	35	ST-3	65	53	61	66	—	—
NB-10	SF	340	1701–1725 S 1st St	35	ST-3	65	48	61	66	—	—
NB-11	SF	113	11–13 E Elwood St	35	LT-3	64	59 ^{X, TB}	60	65	—	—
NB-12	SF	228	15–19 E Elwood St	35	LT-3	58	54 ^{X, TB}	57	62	—	—
NB-13^e	SF	122	7–13 E Raymond St	35	LT-3	65	66^{X, TPSS}	61	66	—	2
NB-14	SF	239	17–25 E Raymond St and 32 E Raymond St	35	LT-3	57	50 ^{X, TPSS}	56	62	—	—
NB-15	SF	240	15 E Jones Ave and 20–22 E Southgate Ave	35	LT-3	58	53 ^{TB}	57	62	—	—
NB-16	SF	180	14 E Southgate Ave	35	LT-3	64	56	60	66	—	—
NB-17	SF	176	17–27 E Southgate Ave	35	LT-3	64	56	60	66	—	—
NB-18	SF	212	18–22 E Riverside St	35	LT-3	63	55	60	65	—	—
NB-19	SF	263	23–29 E Riverside St	35	LT-3	62	59 ^{TB}	59	64	6	—
NB-20	SF	341	16 E Cody Dr	35	LT-3	58	50 ^X	57	63	—	—
NB-21	SF	305	25 E Roeser Rd	35	LT-4	60	50	58	64	—	—

ID ^a	Desc. ^b	Near Track Dist. (feet)	Sensitive Receiver Location	Speed (mph)	Exist. Noise Site	Ldn ^c (dBA)				# of Impacts ^d	
						2015	Build	Impact Threshold			
								Mod.	Severe	Mod.	Severe
NB-22	SF	137	5403 S Central Ave	35	LT-4	64	59 ^{TB}	60	66	—	—
NB-23	SF	108	5615 S Central Ave, 1st row	35	LT-4	69	63 ^{X, TB, TPSS}	63	69	3	—
NB-24	SF	214	5615 S Central Ave, 2nd row	35	LT-4	62	54 ^{X, TPSS}	59	64	—	—
NB-25	SF	151	40 E Hidalgo Ave	35	LT-4	62	51	59	64	—	—
NB-26	SF	227	22–99 E Lynne Lane	35	LT-4	61	52	59	64	—	—
NB-27	SF	248	6210–6232 S 1st St	35	LT-4	62	51	59	64	—	—
NB-28	SF	238	6234–6240 S 1st St and 20–22 E Alta Vista Rd	35	LT-4	61	54 ^{TB}	59	64	—	—
NB-29	SF	257	19 E St. Catherine Ave	35	LT-4	64	54	60	66	—	—
NB-30	SF	175	14–26 E St. Anne Ave and 25 E St. Catherine Ave	35	LT-4	61	51	58	64	—	—
NB-31	SF	191	15 E St. Anne Ave	35	LT-4	65	55	61	66	—	—
NB-32	SF	172	19–25 E St. Anne Ave and 16–26 E St. Charles Ave	35	LT-4	63	53	59	65	—	—
NB-33	SF	145	6645 S Central Ave	35	LT-4	67	58 ^{TB}	62	67	—	—
NB-34	SF	239	21–25 E St. Charles Ave	35	LT-4	59	53 ^{TB}	57	63	—	—
NB-35	SF	174	8–29 E Greenway Rd	35	LT-4	63	53	59	65	—	—
NB-36	SF	96	7001 S Central Ave and 14 E Carter Rd	35	LT-4	69	59 ^{TPSS}	63	69	—	—
NB-37	SF	301	28–31 E Carter Rd	35	LT-4	60	50	58	64	—	—
NB-38	MF	350	Westview Apartments on Sunland	35	LT-1	58	49 ^{TPSS}	57	62	—	—
NB-39	MF	36	Salvation Army Adult Rehab. Center – residential	35	LT-2	67	62 ^{X, TPSS}	63	68	—	—
SB-01	SF	110	704–710 S 1st Ave	30	LT-2	64	59 ^{TB}	60	66	—	—
SB-02	SF	221	113–115 W Grant St	30	LT-2	62	56 ^{TB}	59	64	—	—

ID ^a	Desc. ^b	Near Track Dist. (feet)	Sensitive Receiver Location	Speed (mph)	Exist. Noise Site	Ldn ^c (dBA)				# of Impacts ^d	
						2015	Build	Impact Threshold			
								Mod.	Severe	Mod.	Severe
SB-03	SF	99	801–821 S 1st Ave and 16 W Hadley St	30	LT-2	65	56 ^{LX, TPSS}	61	66	—	—
SB-04	SF	71	1010 S Central Ave	30	LT-2	68	59 ^{TB}	63	68	—	—
SB-05	MF	231	1001–1021 S 1st Ave and 21 W Tonto St	30	LT-2	58	53 ^{TB}	57	62	—	—
SB-06	SF	246	1105–1115 S 1st Ave	35	LT-2	59	54 ^{TB}	57	63	—	—
SB-07	SF	303	1217–1221 S 1st Ave	35	LT-2	58	57 ^{TB}	57	62	2	—
SB-08	SF	215	1301–1321 S 1st Ave and 2–98 W Papago St	35	LT-3	63	59 ^{TB}	59	65	10	—
SB-09	SF	155	16–18 W Fulton St	35	LT-3	60	53 ^X	58	64	—	—
SB-10	SF	265	22–30 W Fulton St	35	LT-3	56	49 ^X	56	62	—	—
SB-11	SF	65	3716 S Central Ave	35	LT-3	70	63 ^{X, TPSS}	65	70	—	—
SB-12	SF	301	25 W Fulton St and various on W West Rd	35	LT-3	57	48 ^X	56	62	—	—
SB-13	MF	257	20–28 W Illini St	35	LT-3	60	51	58	63	—	—
SB-14	SF	280	11–29 W Illini St and 32 W Jones Ave	35	LT-3	59	51	57	63	—	—
SB-15	SF	175	15, 20 W Jones Ave	35	LT-3	60	55 ^{TB}	58	63	—	—
SB-16	SF	270	35 W Jones Ave and 20–34 W Southgate Ave	35	LT-3	57	52 ^{TB}	56	62	—	—
SB-17	SF	261	19–35 W Southgate Ave and 20–32 W Riverside St	35	LT-3	58	49	57	62	—	—
SB-18	SF	366	31 W Riverside St and 30–34 W Pueblo Ave	35	LT-3	58	49	57	62	—	—
SB-19	SF	107	4216 S Central Ave	35	LT-3	67	62 ^{TB}	62	68	2	—
SB-20	SF	198	11 W Corona Ave and 20 W Marguerite Ave	35	LT-3	64	55	60	66	—	—
SB-21	SF	300	21–29 W Corona Ave and 30–106 W Marguerite Ave	35	LT-3	55	47	55	61	—	—

ID ^a	Desc. ^b	Near Track Dist. (feet)	Sensitive Receiver Location	Speed (mph)	Exist. Noise Site	Ldn ^c (dBA)				# of Impacts ^d	
						2015	Build	Impact Threshold			
								Mod.	Severe	Mod.	Severe
SB-22	SF	343	30–32 W Tamarisk Ave	35	LT-3	56	52 ^{TB}	56	62	—	—
SB-23	SF	68	S Central Ave and W Cody Dr, 1st and 2nd rows	35	LT-3	72	65 ^{X, TB}	65	71	16	—
SB-24	SF	265	S Central Ave and W Cody Dr, 3rd and 4th rows	35	LT-4	57	50 ^X	56	62	—	—
SB-25	SF	382	1008 W Roeser Rd	35	LT-4	57	47	56	62	—	—
SB-26	SF	187	17–23 W Roeser Rd, 100 W Grove St, 5223 S 1st Ave	35	LT-4	62	59 ^{TB}	59	65	4	—
SB-27	SF	312	101–107 W Roeser Rd, 102–108 W Grove St	35	LT-4	57	57 ^{TB}	56	62	4	—
SB-28	SF	182	5227-5249 S 1st Ave	35	LT-4	66	60 ^{TB}	61	67	—	—
SB-29	SF	354	101 W Grove St, 102 W Chambers St	35	LT-4	56	56 ^{TB}	56	62	2	—
SB-30	SF	199	5403–5421 S 1st Ave	35	LT-4	65	55	61	67	—	—
SB-31	SF	348	101 W Chambers St, 102 W Bowker St	35	LT-4	56	46	56	62	—	—
SB-32	SF	200	5423 S 1st Ave, 101 W Bowker St, 20–24 W Sunland Ave	35	LT-4	61	55 ^{X, TB}	58	64	—	—
SB-33	SF	329	103–107 W Bowker St, 104–106 W Sunland Ave	35	LT-4	57	52 ^{TB}	56	62	—	—
SB-34	SF	354	105 W Sunland Ave	35	LT-4	60	50	58	63	—	—
SB-35	SF	371	6202–6222 S 1st Ave	35	LT-4	59	49	57	63	—	—
SB-36	SF	371	6224–6244 S 1st Ave	35	LT-4	59	49	57	63	—	—
SB-37	MF	236	17–107 W Alta Vista Rd, 16–108 W St. Catherine Ave	35	LT-4	62	54 ^{TB}	59	64	—	—
SB-38	SF	199	27–35 W St. Charles Ave	35	LT-4	62	55 ^{TB}	59	65	—	—

ID ^a	Desc. ^b	Near Track Dist. (feet)	Sensitive Receiver Location	Speed (mph)	Exist. Noise Site	Ldn ^c (dBA)				# of Impacts ^d	
						2015	Build	Impact Threshold			
								Mod.	Severe	Mod.	Severe
SB-39	SF	228	6810 S Central Ave, 90 W Maldonado Pl	35	LT-4	62	54 ^{TB}	59	64	—	—
SB-40	MF	246	22–104 W Carson Rd, 17–29 W Carson Rd	35	LT-4	60	49	58	63	—	—
SB-41	SF	249	26–34 W Fremont Rd, 25 W Fremont Rd	35	LT-4	62	54 ^{TB}	59	64	—	—
<i>SB-42^e</i>	<i>SF</i>	<i>64</i>	<i>7252 S Central Ave, 1st row, 7246 S Central Ave</i>	<i>35</i>	<i>LT-4</i>	<i>70</i>	<i>67^{X, TB}</i>	<i>64</i>	<i>69</i>	<i>2</i>	<i>—</i>
SB-43	SF	316	7252 S Central Ave, 2nd row	35	LT-1	58	57 ^{TB}	57	62	1	—
SB-44	MF	338	825 N 2nd Ave	25	LT-1	55	44 ^{LX}	55	61	—	—
SB-45	HT	315	631 N 1st Ave	25	LT-1	70	50 ^{LX}	64	70	—	—

Notes: dBA = A-weighted decibel, Ldn = day-night equivalent sound level, mph = miles per hour

^a ID identifies sensitive receivers as shown in Figures 3-6 through 3-9. NB = northbound side, SB = southbound side.

^b Description of land use: SF = single-family residence, MF = multifamily residence, HT=hotel.

^c Rounded to nearest whole number in accordance with Federal Transit Administration guidance.

X: Includes special trackwork (standard crossover) noise.

LX: Includes special trackwork from crossover that is already known to be low-impact (moveable point/spring frog).

CB: Includes crossing gate bell noise. TB: Includes train bell noise at stoplights or train stations. TPSS: Includes traction power substation unit noise.

^d Number of impacts. This is a count of the number of properties/units represented for each potentially affected sensitive receiver cluster.

^e Bolded and italicized entries indicate locations of moderate noise impacts (at least 1 dB over the FTA criteria threshold) or severe impacts.

TABLE 3-21: SUMMARY OF NOISE IMPACT ASSESSMENT FOR CATEGORY 3

ID ^a	Desc. ^b	Near Track Dist. (feet)	Sensitive Receiver Location	Speed (mph)	Exist. Noise Site	Leq ^c (dBA)				# of Impacts ^d	
						2015	Build	Impact Threshold			
								Mod.	Severe	Mod.	Severe
NB-A	SC	52	Arizona Summit Law School	25	ST-1	72	55 ^{LX}	70	76	—	—
NB-B	Court	33	Maricopa County Justice Courts	25	LT-1	67	53 ^{LX}	68	73	—	—
NB-C	SC	36	Salvation Army Adult Rehab. Center	35	LT-2	72	68 ^{X, TB, TPSS}	70	76	—	—
NB-D	Habitat	50	Rio Salado Habitat Restoration Area	35	ST-4	65	58 ^{TB}	66	71	—	—
NB-E	Habitat	50	Rio Salado Habitat Restoration Area – Audubon Center	30	ST-4	65	65 ^{CB}	66	71	—	—
NB-E1	SC	290	Rio Salado Audubon Center buildings – includes classroom	30	ST-4A	57	55 ^{CB, TB}	61	67	—	—
NB-F	CH	49	Revealed Word Church	35	LT-3	70	61 ^{X, TPSS}	69	75	—	—
NB-G	CH	91	Espiritu School Chapel and Offices	35	ST-5	64	56 ^{TB}	65	71	—	—
NB-H	SC	304	Espiritu Schools	35	ST-5	56	49 ^{TB}	61	66	—	—
NB-I	CH	148	Central DI Ministries	35	ST-6	66	55 ^{X, TB}	66	72	—	—
NB-J	HP	95	Southside Animal Hospital	35	ST-8	67	59 ^{TB}	67	73	—	—
NB-K	SC	110	St. Catherine of Siena Catholic School	35	ST-8	66	55 ^{TB}	67	72	—	—
NB-L	CH	68	South Mountain Mortuary	35	LT-4	71	57 ^{TB, TPSS}	70	75	—	—
NB-M	CH	357	Christian Science First Church	25	ST-1	61	45 ^{LX}	63	69	—	—
SB-A	Court	95	Superior Court of Arizona in Maricopa County	25	LT-1	63	49 ^{LX}	64	70	—	—
SB-B	Court/LB	51	Maricopa East Court Building/Law Library	25	LT-1	63	53 ^{LX, TB}	65	70	—	—
SB-C	Court	130	Maricopa County Superior Courthouse	25	LT-1	62	50 ^{TB}	64	70	—	—

ID ^a	Desc. ^b	Near Track Dist. (feet)	Sensitive Receiver Location	Speed (mph)	Exist. Noise Site	Leq ^c (dBA)				# of Impacts ^d	
						2015	Build	Impact Threshold			
								Mod.	Severe	Mod.	Severe
SB-D	SC	285	Friendly House – Adult Education and Workforce Development	30	ST-2	60	47 ^{LX}	63	68	—	—
SB-E	CH	210	St. Anthony Catholic Church	30	ST-2	63	50	64	70	—	—
SB-F	CH	207	Iglesia Apostolica Cristiana	35	LT-3	63	53 ^X	64	70	—	—
SB-G	CH	49	Preston Funeral Home	35	LT-3	71	58 ^{X, TPSS}	70	75	—	—
SB-H	SC	134	Preschool	35	ST-5	63	54 ^{TB}	65	70	—	—
SB-I	SC	56	Phoenix Collegiate Academy	35	ST-6	73	64 ^{X, TB}	70	76	—	—
SB-J	LB	381	Ocotillo Library	35	ST-6	56	43	61	67	—	—
SB-K	CH	106	St. Catherine of Siena Roman Catholic Church	35	ST-8	67	54 ^{TB}	67	72	—	—
SB-L	CH	80	Southern Baptist Temple	35	ST-8	68	55	68	73	—	—
SB-M	SC	110	St. John Bosco Chapel/ St. Catherine of Siena Catholic Preschool	35	ST-8	67	54	67	72	—	—
SB-N	MD	142	Cigna Medical Group	35	ST-7	64	57 ^{X, TB, TPSS}	65	71	—	—
SB-O	SC	180	Phoenix College Downtown	25	LT-1	67	48 ^{LX}	67	73	—	—

Notes: dBA = A-weighted decibel, Leq = equivalent sound level, mph = miles per hour

^a ID identifies sensitive receivers as shown in the maps in Figures 3-6 through 3-9. NB = northbound side, SB = southbound side.

^b Description of land use: SC = school, CH = church, MD = medical, Court = courthouse, LB = library, Habitat = habitat restoration area.

^c Maximum 1-hour Leq during daytime when facility is in use. Rounded to nearest whole number in accordance with Federal Transit Administration guidance.

X: Includes special trackwork (standard crossover) noise.

LX: Includes special trackwork from crossover that is already known to be low-impact (moveable point/spring frog).

CB: Includes crossing gate bell noise. TB: Includes train bell noise at stoplights or train stations. TPSS: Includes traction power substation unit noise.

^d Number of impacts. This is a count of the number of properties/units represented for each potentially affected sensitive receiver cluster.

The potential for the light rail vehicles to generate wheel squeal on sharp curves was not included in the noise impact analysis since all existing vehicles are equipped, and all new vehicles would be equipped, with friction control devices for use near sensitive receivers. Sharper curves associated with the proposed Build Alternative would occur only for infrequent, nonrevenue train movement to and from the OMC. No revenue service train movements would occur through sharp curves.

Traction Power Substation Noise

Six TPSS locations are being evaluated, and five would be selected for implementation as discussed in Chapter 2.0. The TPSS locations were shown previously (as purple rectangles) in Figures 3-6 to 3-9. All of the TPSS sites are adjacent to at least one sensitive receiver being evaluated. A noise impact is indicated when the predicted TPSS nighttime Leq noise level exceeds the existing nighttime Leq minus 5 dB. This approach for assessing TPSS noise impacts is more stringent than the FTA impact criteria and ensures no impacts are overlooked. Using the criteria, the analysis indicated the only impact would occur at the TPSS unit at the southeastern corner of Central Avenue and Raymond Street (shown in Figure 3-8, between Elwood Street and Broadway Road). There, receiver NB-13 (two single-family residences: 7 East Raymond Street and 13 East Raymond Street) is very close to the TPSS unit, resulting in a 6-dBA exceedance of the impact criteria. This is the same receiver showing a severe impact for Build Alternative noise in Table 3-20, with the TPSS unit contributing to the impact.

Roadway Configuration and Bus Operational Frequency Changes

The Build Alternative would involve some physical roadway changes and bus headway (frequency) changes. These were considered in the evaluation at the locations discussed below.

Several intersections would flare outward toward adjacent properties, some containing sensitive land uses. The flares would accommodate automobile turning and through lanes along Central Avenue at Buckeye Road, Broadway Road, Southern Avenue and Baseline Road. Along Central Avenue, the RAPID bus route would be eliminated and local bus Route 0, also serving Central Avenue, would have its headway reduced. An analysis was conducted to compare noise impacts of the No-Build and Build Alternatives considering the roadway and bus operational changes. This analysis was done separately from the operational light rail noise analysis, which is a typical first step to determine whether noise from roadway and bus changes needs to be included in potential noise impact predictions.

The analysis showed that a decrease in sound level would actually occur adjacent to Central Avenue (1 to 2 dB), with the exception of very short distances to the road (25 feet), where only a slight increase (less than 1 dB) would occur. The lane relocation outward toward adjacent properties would increase noise, particularly close to the road; the decrease in bus service frequencies would decrease noise and the decrease in traffic would decrease noise. Therefore, the combined effect would be minimal and negligible very close to the road and would slightly decrease the noise farther from the road. Given the minimal combined effect, these changes were not included in Build Alternative noise predictions.

Two roundabouts are proposed along Central Avenue as part of the Build Alternative. Only the roundabout adjacent to the RSHRA and Audubon Center south of the Salt River is near sensitive receivers (sensitive receivers NB-E and NB-E1). The roundabout would move some of the traffic closer and some farther away from the receivers. As with the first analysis, the traffic volumes (including buses) would decrease because of the Build Alternative. The analysis results showed a net decrease in sound level. As a result, these changes were not included in the Build Alternative noise predictions.

On Baseline Road, bus volumes would change as a result of the Build Alternative. The RAPID bus would be eliminated, and Route 77 volumes would increase because of the addition of a Route 77A overlay service that would shuttle riders between the Baseline Road/Central Avenue station and two existing park-and-ride lots along Baseline Road both east and west of Central Avenue. To simplify the analysis for this scenario, predictions were made for just the No-Build Alternative with and without the bus changes. This isolates the effect of the bus changes. The analysis showed that no change in sound level would result from the bus change, since the elimination of one line and increase in volume of another line would result in the same maximum number of buses during the peak hour. Therefore, the change in buses along Baseline Road warrants no further consideration.

In summary, neither the planned roadway configuration changes nor the changes in bus headways would adversely affect sensitive land uses. (Note: Since the effects from these changes are minimal, they are not included in the operational noise impact predictions.)

Park-and-ride Facilities

The park-and-ride lots to be used for the Build Alternative consist of one proposed at Broadway Road and Central Avenue, one proposed near Fremont Road and Central Avenue (near the proposed light rail's terminus) and two existing park-and-ride lots along Baseline Road.

The Ed Pastor Transit Center is at Broadway Road and Central Avenue, and an approximately 80-space adjacent lot would be added as part of the Build Alternative. The closest sensitive receiver is at a distance of 115 feet. At that distance, the noise from an 80-space parking lot would result in a peak hour Leq of 42 dBA. In the area, the existing noise is approximately 69 dBA Leq peak and Ldn. Since the park-and-ride lot noise would be so far below the existing noise, the changes in the parking lot would not result in increased noise at surrounding receivers. Therefore, no further consideration is warranted.

On the western side of Central Avenue, between Fremont Road and the Western Canal (near the proposed Baseline Road/Central Avenue station), an approximately 365-space lot would be added as part of the Build Alternative. This T-shaped lot would connect to both Fremont Road and Central Avenue. Several sensitive receivers surround the lot, ranging from distances of 25 to 65 feet from various edges of the lot. The existing noise for the surrounding receivers ranges from 52 to 64 dBA Leq. The predicted lot noise levels, based on the number of spaces and entering/exiting vehicles affecting each receiver, would be below the existing noise levels. Although below the existing levels, some were within 10 dB and, therefore, warranted an examination that

includes other Build Alternative noise. When the lot noise was combined with the other Build Alternative noise (train operations, TPSSs, etc.), no potential noise impacts were predicted for any of the surrounding receivers other than where a moderate impact was already predicted at SB-43. For that receiver, the impact exceedance would not increase because of the park-and-ride lot. In summary, the analysis shows that the lot near Central Avenue and Fremont Road would not contribute to potential Build Alternative noise impacts for any sensitive receiver, based on FTA impact limits.

For the two existing lots on Baseline Road, no substantial change to current use is anticipated as a result of the Build Alternative because passengers now parking there to ride the RAPID line to Downtown Phoenix would continue to park there after the RAPID line is eliminated and would instead use the local bus route to travel to the end-of-line Baseline Road/Central Avenue station to ride the light rail. Therefore, these lots require no further consideration of noise impact.

In summary, the park-and-ride facilities would have no adverse traffic noise impact on nearby sensitive uses.

Traffic Mitigation on 7th Avenue and 7th Street

Traffic mitigation measures are proposed at three locations on 7th Avenue and 7th Street as part of the Build Alternative (see Section 3.6). These are: added right-turn and through lanes at the intersection of 7th Street and I-17, added right-turn lanes at the intersection of 7th Avenue and I-17 and added right-turn lanes at the intersection of 7th and Southern Avenues. No sensitive receivers are at the intersections of 7th Avenue and I-17 or 7th Street and I-17; however, residences are near the intersection of 7th and Southern Avenues. All work would be within the existing City of Phoenix ROW, except at the intersection of 7th and Southern Avenues. Here, right-turning traffic would be shifted slightly closer (an estimated 2 to 3 feet) to sensitive receivers because of the addition of right-turn lanes, resulting in a less than 1 dB noise increase; through traffic would be shifted slightly farther from sensitive receivers, resulting in a less than 1 dB noise decrease. The combined effect of the intersection changes is negligible.

In summary, the proposed traffic mitigation area would have no adverse noise impacts on sensitive receivers.

Operations and Maintenance Center

Although the proposed Build Alternative includes planned improvements to facilities at the existing OMC site, east of Phoenix Sky Harbor International Airport and southwest of the intersection of the Grand Canal and Loop 202, no land uses in the vicinity are sensitive to noise impacts. The major land uses surrounding the OMC include commercial, light industrial and aviation (Phoenix Sky Harbor International Airport) and do not contain any sensitive noise receptors. Additional automobile trips to and from the OMC as a result of additional employees would not affect noise levels. Therefore, the proposed OMC improvements would have no noise impacts on sensitive land uses.

3.8.3.2 Vibration

The key FTA 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 hertz. This means that for residential land uses, an impact would occur if any 1/3 octave band level between 8 and 80 hertz is predicted to exceed 72 VdB. The following summarizes the vibration impact assessment of the proposed light rail extension:

- No Category 1 (highly sensitive) land uses or “special buildings” were identified along the Build Alternative corridor. Therefore, the proposed Build Alternative would have no effect on such buildings and land uses.
- Many Category 2 (residential) land uses are located along the route. As shown in Table 3-22, vibration impact is predicted at several Category 2 sensitive receivers. Two receivers in the Downtown area are less than 50 feet from the alignment, the Hotel Palomar and the Barrister Place building. Vibration impacts to single-family residences would also occur outside the Downtown area at the following locations:
 - o NB-07: 1001–1009 South Central Avenue
 - o SB-11: 3716 South Central Avenue
 - o SB-23: homes in northwestern quadrant of Central Avenue and Cody Drive
 - o SB-42: 7252 South Central Avenue (first row homes) and 7246 South Central Avenue
- Many Category 3 (institutional) receivers are located along the route. Table 3-23 presents the results of the groundborne noise and vibration impacts analysis for Category 3 land uses. Several of these are Downtown at government and office buildings. A number of Category 3 receivers are also farther south throughout the alignment. Several of these have predicted groundborne noise and vibration impacts:
 - o NB-A: Arizona Summit Law School
 - o NB-B: Maricopa County Justice Courts
 - o NB-07: 1001–1009 South Central Avenue
 - o SB-11: 3716 South Central Avenue
 - o SB-23: homes in northwestern quadrant of Central Avenue and Cody Drive

Although the proposed Build Alternative includes planned improvements to facilities at the existing OMC site, east of Phoenix Sky Harbor International Airport and southwest of the intersection of the Grand Canal and Loop 202, no land uses in the vicinity are sensitive to vibration impacts. Therefore, the proposed OMC improvements would have no vibration impacts on sensitive land uses.

TABLE 3-22: SUMMARY OF VIBRATION IMPACT ASSESSMENT FOR CATEGORY 2

ID ^a	Desc. ^b	Near Track Dist. (feet)	Sensitive Receiver Location	Speed (mph)	GBV ^{c,d} (VdB)	GBN ^d (dBA)	GBN Criteria ^d (dBA)	GBV Impact ^e	GBN Impact ^e
NB-01	HT	17	Hotel Palomar Phoenix	25	78	53	44	Y	Y
NB-02	MF	21	Barrister Place (potential multiuse redevelopment with residential component)	25	77	53	43	Y	Y
NB-03	HT	43	Luhrs City Center Marriott (under construction)	25	64	38	40	—	—
NB-04	SF	198	700–722 S 1st St	30	61	30	42	—	—
NB-05	SF	148	734–800 S 1st St and 12 E Hadley St	30	62	34	41	—	—
NB-06	SF	208	900–922 S 1st St	30	60	30	41	—	—
NB-07	SF	54	1001–1009 S Central Ave	30	72^f	47	50	Y	—
NB-08	SF	210	1000–1022 S 1st St	30	60	30	41	—	—
NB-09	SF	181	1706–1712 S 1st St	35	62	33	43	—	—
NB-10	SF	340	1701–1725 S 1st St	35	60	25	39	—	—
NB-11	SF	113	11–13 E Elwood St	35	67	40	45	—	—
NB-12	SF	228	15–19 E Elwood St	35	61	30	40	—	—
NB-13	SF	122	7–13 E Raymond St	35	70	42	48	—	—
NB-14	SF	239	17–25 E Raymond St and 32 E Raymond St	35	61	30	39	—	—
NB-15	SF	240	15 E Jones Ave and 20–22 E Southgate Ave	35	61	29	40	—	—
NB-16	SF	180	14 E Southgate Ave	35	62	33	46	—	—
NB-17	SF	176	17–27 E Southgate Ave	35	62	33	47	—	—
NB-18	SF	212	18–22 E Riverside St	35	62	31	46	—	—
NB-19	SF	263	23–29 E Riverside St	35	61	28	45	—	—
NB-20	SF	341	16 E Cody Dr	35	60	25	41	—	—
NB-21	SF	305	25 E Roeser Rd	35	60	27	41	—	—

ID ^a	Desc. ^b	Near Track Dist. (feet)	Sensitive Receiver Location	Speed (mph)	GBV ^{c,d} (VdB)	GBN ^d (dBA)	GBN Criteria ^d (dBA)	GBV Impact ^e	GBN Impact ^e
NB-22	SF	137	5403 S Central Ave	35	64	36	45	—	—
NB-23	SF	108	5615 S Central Ave, 1st row	35	71	44	49	—	—
NB-24	SF	214	5615 S Central Ave, 2nd row	35	62	31	43	—	—
NB-25	SF	151	40 E Hidalgo Ave	35	63	35	42	—	—
NB-26	SF	227	22–99 E Lynne Lane	35	61	30	42	—	—
NB-27	SF	248	6210–6232 S 1st St	35	61	29	42	—	—
NB-28	SF	238	6234–6240 S 1st St and 20–22 E Alta Vista Rd	35	61	30	42	—	—
NB-29	SF	257	19 E St. Catherine Ave	35	61	29	45	—	—
NB-30	SF	175	14–26 E St. Anne Ave and 25 E St. Catherine Ave	35	62	33	42	—	—
NB-31	SF	191	15 E St. Anne Ave	35	62	32	46	—	—
NB-32	SF	172	19–25 E St. Anne Ave and 16–26 E St. Charles Ave	35	62	33	44	—	—
NB-33	SF	145	6645 S Central Ave	35	64	35	47	—	—
NB-34	SF	239	21–25 E St. Charles Ave	35	61	30	40	—	—
NB-35	SF	174	8–29 E Greenway Rd	35	62	33	44	—	—
NB-36	SF	96	7001 S Central Ave and 14 E Carter Rd	35	67	41	49	—	—
NB-37	SF	301	28–31 E Carter Rd	35	60	27	41	—	—
NB-38	MF	350	Westview Apartments	25	56	22	36	—	—
NB-39	MF	68	Salvation Army Adult Rehab. Center – Residential	25	69	43	48	—	—
SB-01	MF	110	704–710 S 1st Ave	30	65	38	47	—	—
SB-02	SF	221	113–115 W Grant St	30	60	29	44	—	—
SB-03	SF	206	801–821 S 1st Ave and 16 W Hadley St	30	65	39	48	—	—
SB-04	SF	84	1010 S Central Ave	30	69	43	49	—	—

ID ^a	Desc. ^b	Near Track Dist. (feet)	Sensitive Receiver Location	Speed (mph)	GBV ^{c,d} (VdB)	GBN ^d (dBA)	GBN Criteria ^d (dBA)	GBV Impact ^e	GBN Impact ^e
SB-05	SF	244	1001–1021 S 1st Ave and 21 W Tonto St	30	60	29	39	—	—
SB-06	MF	270	1105–1115 S 1st Ave	35	61	29	42	—	—
SB-07	SF	329	1217–1221 S 1st Ave	35	60	27	39	—	—
SB-08	SF	230	1301–1321 S 1st Ave and 2–98 W Papago St	35	62	31	46	—	—
SB-09	SF	168	16–18 W Fulton St	35	63	35	42	—	—
SB-10	SF	278	22–30 W Fulton St	35	61	28	38	—	—
SB-11	SF	78	3716 S Central Ave	35	74	48	51	Y	—
SB-12	SF	314	25 W Fulton St and various on W West Rd	35	60	27	39	—	—
SB-13	SF	270	20–28 W Illini St	35	61	29	42	—	—
SB-14	MF	293	11–29 W Illini St and 32 W Jones Ave	35	60	28	42	—	—
SB-15	SF	188	15, 20 W Jones Ave	35	62	33	42	—	—
SB-16	SF	283	35 W Jones Ave and 20–34 W Southgate Ave	35	61	28	40	—	—
SB-17	SF	277	19–35 W Southgate Ave and 20–32 W Riverside St	35	61	28	40	—	—
SB-18	SF	391	31 W Riverside St and 30–34 W Pueblo Ave	35	59	25	40	—	—
SB-19	SF	132	4216 S Central Ave	35	66	39	49	—	—
SB-20	SF	214	11 W Corona Ave and 20 W Marguerite Ave	35	62	32	46	—	—
SB-21	SF	316	21–29 W Corona Ave and 30–106 W Marguerite Ave	35	60	27	38	—	—
SB-22	SF	356	30–32 W Tamarisk Ave	35	59	25	39	—	—
SB-23	SF	87	S Central Ave and W Cody Dr, 1st and 2nd rows	35	75	49	50	Y	—

ID ^a	Desc. ^b	Near Track Dist. (feet)	Sensitive Receiver Location	Speed (mph)	GBV ^{c,d} (VdB)	GBN ^d (dBA)	GBN Criteria ^d (dBA)	GBV Impact ^e	GBN Impact ^e
SB-24	SF	278	S Central Ave and W Cody Dr, 3rd and 4th rows	35	61	28	40	—	—
SB-25	SF	395	1008 W Roeser Rd	35	59	24	38	—	—
SB-26	SF	211	17–23 W Roeser Rd, 100 W Grove St, 5223 S 1st Ave	35	62	32	43	—	—
SB-27	SF	336	101–107 W Roeser Rd, 102–108 W Grove St	35	60	26	38	—	—
SB-28	SF	206	5227–5249 S 1st Ave	35	62	33	46	—	—
SB-29	SF	377	101 W Grove St, 102 W Chambers St	35	59	25	37	—	—
SB-30	SF	213	5403–5421 S 1st Ave	35	62	32	46	—	—
SB-31	SF	362	101 W Chambers St, 102 W Bowker St	35	59	25	37	—	—
SB-32	SF	213	5423 S 1st Ave, 101 W Bowker St, 20–24 W Sunland Ave	35	62	32	41	—	—
SB-33	SF	342	103–107 W Bowker St, 104–106 W Sunland Ave	35	60	26	37	—	—
SB-34	SF	367	105 W Sunland Ave	35	59	25	40	—	—
SB-35	SF	386	6202–6222 S 1st Ave	35	59	24	40	—	—
SB-36	SF	384	6224–6244 S 1st Ave	35	59	24	40	—	—
SB-37	SF	249	17–107 W Alta Vista Rd, 16–108 W St. Catherine Ave	35	61	30	42	—	—
SB-38	MF	212	27–35 W St. Charles Ave	35	62	32	43	—	—
SB-39	SF	241	6810 S Central Ave, 90 W Maldonado Pl	35	61	30	42	—	—
SB-40	SF	259	22–104 W Carson Rd, 17–29 W Carson Rd	35	61	29	40	—	—

ID ^a	Desc. ^b	Near Track Dist. (feet)	Sensitive Receiver Location	Speed (mph)	GBV ^{c,d} (VdB)	GBN ^d (dBA)	GBN Criteria ^d (dBA)	GBV Impact ^e	GBN Impact ^e
SB-41	MF	262	26–34 W Fremont Rd, 25 W Fremont Rd	35	61	29	42	—	—
SB-42	SF	103	7252 S Central Ave, 1st row, and 7246 S Central Ave	35	76	50	51	Y	—
SB-43	SF	355	7252 S Central Ave, 2nd row	35	60	26	39	—	—
SB-44	SF	467	825 N 2nd Ave	25	57	23	36	—	—
SB-45	MF	423	631 N 1st Ave	25	47	13	41	—	—

Notes: Refer to Table F-1 in Appendix E for indications of special trackwork for each receiver; the special trackwork increases vibration levels.

dBA = A-weighted decibel, GBN = groundborne noise, GBV = groundborne vibration, mph = miles per hour, VdB = vibration decibel

^a ID identifies sensitive receivers as shown in the maps in Figures 3-6 through 3-9. NB = northbound side, SB = southbound side.

^b Description of type of land use: SF = single-family residence, MF = multifamily residence, HT = hotel.

^c Groundborne vibration is level in VdB of maximum 1/3 octave band, compared to 72 VdB.

^d Predictions and limits are shown to the nearest decibel.

^e Bolded and italicized entries indicate locations where groundborne noise and/or vibration impact is anticipated.

^f These impacts represent fractional exceedances of less than 1 decibel (still considered an impact).

TABLE 3-23: SUMMARY OF VIBRATION IMPACT ASSESSMENT FOR CATEGORY 3

ID ^a	Desc. ^b	Near Track Dist. (feet)	Sensitive Receiver Location	Speed (mph)	GBV ^{c,d} (VdB)	GBN ^d (dBA)	GBN Criteria ^d (dBA)	GBV Impact ^e	GBN Impact ^e
NB-A	SC	52	Arizona Summit Law School	25	66	40^f	40	—	Y
NB-B	Court	33	Maricopa County Justice Courts	25	67	41^f	41	—	Y
NB-C	SC	36	Salvation Army Adult Rehab. Center	35	78^f	53	43	Y	Y
NB-E1	SC	290	Rio Salado Audubon Center buildings – includes classroom	30	59	26	43	—	—
NB-F	CH	49	Revealed Word Church	35	78^f	52^f	52	Y	Y
NB-G	CH	91	Espiritu School Chapel and Offices	35	67	41	49	—	—
NB-H	SC	304	Espiritu Schools	35	60	27	41	—	—
NB-I	CH	148	Central DI Ministries	35	63	35	47	—	—
NB-J	HP	95	Southside Animal Hospital	35	67	41	49	—	—
NB-K	SC	110	St. Catherine of Siena Catholic School	35	66	39	49	—	—
NB-L	CH	68	South Mountain Mortuary	35	71	45	51	—	—
NB-M	CH	357	Christian Science First Church	25	56	22	41	—	—
SB-A	Court	95	Superior Court of Arizona in Maricopa County	25	54	28	40	—	—
SB-B	Court	51	Maricopa East Court Building/Law Library	25	61	36	40	—	—
SB-C	Court	130	Maricopa County Superior Courthouse	25	52	24	40	—	—
SB-D	SC	285	Friendly House – Adult Education and Workforce Development	30	59	26	43	—	—
SB-E	CH	210	St. Anthony Catholic Church	30	60	30	44	—	—
SB-F	CH	207	Iglesia Apostolica Cristiana	35	62	32	46	—	—
SB-G	CH	49	Preston Funeral Home	35	75	49	52	—	—
SB-H	SC	134	Preschool	35	64	36	48	—	—
SB-I	SC	56	Phoenix Collegiate Academy	35	82	57	52	Y	Y

ID ^a	Desc. ^b	Near Track Dist. (feet)	Sensitive Receiver Location	Speed (mph)	GBV ^{c,d} (VdB)	GBN ^d (dBA)	GBN Criteria ^d (dBA)	GBV Impact ^e	GBN Impact ^e
SB-J	LB	381	Ocotillo Library	35	59	24	43	—	—
SB-K	CH	106	St. Catherine of Siena Roman Catholic Church	35	66	39	44	—	—
SB-L	CH	80	Southern Baptist Temple	35	69	43	50	—	—
SB-M	SC	110	St. John Bosco Chapel/ St. Catherine of Siena Catholic Preschool	35	66	39	49	—	—
SB-N	MD	142	Cigna Medical Group	35	67	39	47	—	—
SB-O	SC	180	Phoenix College Downtown	25	59	30	44	—	—

Notes: Refer to Table F-1 in Appendix E for indications of special trackwork for each receiver; the special trackwork increases vibration levels.

dBA = A-weighted decibel, GBN = groundborne noise, GBV = groundborne vibration, mph = miles per hour, VdB = vibration decibel

^a ID identifies sensitive receivers as shown in the maps in Figures 3-6 through 3-9; note that NB-D and NB-E are habitat restoration areas that are not assessed for vibration. NB = northbound side, SB = southbound side.

^b Description of type of land use: SC = school, CH = church, MD = medical, Court = courthouse, LB = library.

^c Groundborne vibration is level in VdB of maximum 1/3 octave band, compared to 78 VdB.

^d Predictions and limits are shown to the nearest decibel.

^e Bolded and italicized entries indicate locations where groundborne noise and/or vibration impact is anticipated.

^f These impacts represent fractional exceedances of less than 1 decibel (still considered an impact).

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

Table 3-24 summarizes noise limit exceedances and mitigation measures for each potentially affected sensitive receiver. Impact exceedance is shown as an exceedance of a moderate impact level (with severe impact noted).

Mitigation would not be implemented for exceedances less than 1 dB of the moderate impact threshold. As noted in Table 3-24, these minor exceedances would occur at several locations near special trackwork and also at some stations because of sounding of train bells. A less than 1-dB change in noise level with the Build Alternative is negligible given that 3 dB is considered the threshold at which an average listener can detect a change. Therefore, mitigation would not be implemented for exceedances less than 1 dB of the moderate impact threshold.

In addition, note that where train bells at stations cause a less than 1-dB exceedance, these bells are safety-related and already at a low level setting, so no mitigation is warranted. In the case of special trackwork causing a less than 1-dB exceedance, the exceedances are actually 0 and -0.2 dB (required rounding causes the level to meet the limit); in these cases, no mitigation is warranted. For all predictions and mitigation recommendations, it is assumed that the track and wheels would be maintained in a state of good repair (that is, rail corrugations and wheel flats would be minimized through rail grinding and wheel truing).

Mitigation would be implemented for the two exceedances of the noise impact criteria of greater than 1 dB, one moderate (SB-42, two homes) and one severe (NB-13, two homes) as follows:

- **SB-42 (two homes at 7252 and 7246 South Central Avenue)** – These homes are close to special trackwork. The ramps on standard light rail flange-bearing frogs (Figure 3-11) for this trackwork are short enough that the load transfer would be quite abrupt and would generate substantial noise and vibration. Low-impact frogs would be installed instead to create a smoother transition through the gap in the rails at the special trackwork. Examples of low-impact frogs include moveable point frogs, spring-rail frogs, monoblock frogs or flange-bearing frogs (refer to Appendix E for more information). This would reduce the moderate impact below the applicable FTA criteria thresholds.
- **NB-13 (two homes at 7 and 13 East Raymond Street)** – Installation of a low-impact frog for the nearby special trackwork would reduce the severe impact to moderate with a 3.4-dB exceedance. To reduce the moderate impact

**FIGURE 3-11:
STANDARD FROG**



below the applicable FTA threshold would also require locating the nearby TPSS unit strategically 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 could be reduced to below the applicable threshold. The cooling fans on the TPSS unit should face east or south and should be more than 50 feet from the nearest residence to reduce the predicted noise levels to below the impact threshold (when combined with the low-impact frog). If there is not much flexibility on where to locate the unit within the parcel, a sound enclosure should be built around the TPSS unit to reduce noise levels at sensitive receivers. The sound enclosure would need to reduce noise by 3.4 dB, which is attainable with proper design of the enclosure (appropriately considering the cooling fan height above ground). Since only five of the six TPSS locations being evaluated would be chosen, it may be possible to eliminate this location as an option and thus remove the TPSS unit as a sound source for nearby receivers. The potential to eliminate any of the specific TPSS sites being considered would be determined as the design is refined and electrical load requirements can be calculated to assist in accurately determining TPSS locations for the proposed Build Alternative.

TABLE 3-24: RECOMMENDED NOISE MITIGATION

ID ^a	Desc. ^b	Sensitive Receiver Location	Impact Exceedance		Recommended Mitigation
			dB ^c	Cause	
NB-13	SF	7–13 E Raymond St	5 ^d	Special trackwork, TPSS unit	Use low-impact frog for special trackwork at Raymond St; strategic placement/orientation of TPSS unit
NB-19	SF	23–29 E Riverside St	<1	Train bells at station	Mitigation not recommended for exceedances of <1 dB
NB-23	SF	5615 S Central Ave, 1st row homes	<1	Special trackwork	Mitigation not recommended for exceedances of <1 dB
SB-07	SF	1217–1221 S 1st Ave	<1	Train bells at station	Mitigation not recommended for exceedances of <1 dB
SB-08	SF	1301–1321 S 1st Ave and 2–98 W Papago St	<1	Train bells at station	Mitigation not recommended for exceedances of <1 dB
SB-19	SF	4216 S Central Ave	<1	Train bells at station	Mitigation not recommended for exceedances of <1 dB
SB-23	SF	S Central Ave and W Cody Dr., 1st and 2nd row homes	<1	Special trackwork	Mitigation not recommended for exceedances of <1 dB
SB-26	SF	17–23 W Roeser Rd, 100 W Grove St, 5223 S 1st Ave	<1	Train bells at station	Mitigation not recommended for exceedances of <1 dB
SB-27	SF	101–107 W Roeser Rd, 102–108 W Grove St	<1	Train bells at station	Mitigation not recommended for exceedances of <1 dB
SB-29	SF	101 W Grove St, 102 W Chambers St	<1	Train bells at station	Mitigation not recommended for exceedances of <1 dB
SB-42	SF	7252 S Central Ave, 1st row, and 7246 S Central Ave	3	Special trackwork, train bells at station	Use low-impact frog for special trackwork in the vicinity of Western Canal
SB-43	SF	7252 S Central Ave, 2nd row	<1	Train bells at station	Mitigation not recommended for exceedances of <1 dB

Notes: dB = decibel, TPSS = traction power substation

^a ID identifies sensitive receivers as shown in the maps in Figures 3-6 through 3-9. NB = northbound side, SB = southbound side.

^b Description of type of land use: SF = single-family

^c Moderate limit exceedance

^d This exceedance qualifies as a severe impact.

3.8.4.2 Vibration Mitigation

The mitigation measures presented in Table 3-25 would be implemented to minimize the adverse impacts at a number of Category 2 and 3 sensitive land uses.

TABLE 3-25: VIBRATION MITIGATION FOR SENSITIVE RECEIVERS

ID ^a	Desc. ^b	Sensitive Receiver Location	GBV (VdB)		GBN (dBA)		# of Units	Recommended Mitigation	Mitigation, Feet Beyond Edge of Building	Total Length of Mitigation (feet)
			Limit	Predict	Limit	Predict				
NB-01	HT	Hotel Palomar Phoenix	72	78	44	53	190	Isolated slab track	65	480
NB-02	MF	Barrister Place (potential multiuse re-development with residential component)	72	77	43	53	35	Isolated slab track	65	
NB-07	SF	1001–1009 S Central Ave	72	72 ^c	50	47	3	Rail boot	60	280
SB-11	SF	3716 S Central Ave	72	74	51	48	1	Low-impact frog	—	—
SB-23	SF	S Central Ave and W Cody Dr	72	75	50	49	16	Low-impact frog	—	—
SB-42	SF	7252 S Central Ave, 1st row, and 7246 S Central Ave	72	76	51	50	2	Low-impact frog	—	—
NB-A	SC	Arizona Summit Law School	78	66	40	40 ^c	1	Rail boot	55	210
NB-B	Court	Maricopa County Justice Courts	78	67	41	41 ^c	1	Rail boot	40	230
NB-C	MD	Salvation Army Adult Rehab Center	78	78 ^c	43	53	1	Low-impact frog Rail boot	65	480
NB-F	CH	Revealed Word Church	78	78 ^c	52	52 ^c	1	Low-impact frog	—	—
SB-I	SC	Phoenix Collegiate Academy	78	82	52	57	1	Low-impact frog	—	—

Notes: dBA = A-weighted decibel, GBN = groundborne noise, GBV = groundborne vibration, VdB = vibration decibel

^a ID identifies sensitive receivers as shown in the maps in Figures 3-6 through 3-9. NB = northbound side, SB = southbound side.

^b Description of type of land use: SF = single-family residential, MF = multifamily residential, Court = courthouse, MD = medical center, CH = church, SC = school.

^c Levels are reported to the nearest decibel. These numbers represent fractional exceedances of less than 1 decibel (still considered an impact).

- **NB-01 (Hotel Palomar) and NB-02 (Barrister Place planned multiuse redevelopment with residential component)** – Both buildings are Downtown and would be affected by the proximity of track (approximately 20 feet) and the presence of special trackwork (for example, crossovers and loops). If it is not possible to relocate either the track or special trackwork farther from these buildings, then isolated slab track would be installed.
- **NB-A (Arizona Summit Law School), NB-B (Maricopa County Justice Courthouse) and NB-07 (three single-family homes at 1001 to 1009 South Central Avenue)** – A less than 1-dB exceedance of the groundborne noise criteria is anticipated for the law school and courthouse and a less than 1-VdB exceedance of the vibration criteria threshold is expected at the three houses. Rail boots would be installed for trackwork near all of these receivers. A rail boot consists of a rubber boot around the rail with the rail and boot embedded in concrete.
- **NB-C (Salvation Army Adult Rehabilitation Center)** – Installation of a low-impact frog for the special trackwork and a rail boot would mitigate the vibration impact exceedance levels of 1 Vdb and the groundborne noise impact exceedance level of approximately 10 dB.
- **All other sensitive uses listed in Table 3-25 (19 houses at SB-11, SB-23 and SB-42; NB-F [Revealed Word Church] and SB-I [Collegiate Academy])** – Installation of low-impact frogs at the nearby special trackwork would mitigate groundborne noise and/or vibration impacts at all locations.

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 existing and proposed light rail. The study area for the energy analysis encompasses the Phoenix metropolitan region. The most common energy sources for transportation include petroleum-based fuels for automobiles, trucks and buses. Currently, 66 percent of Valley Metro's bus fleet operates on compressed natural gas, approximately 19 percent on biodiesel and approximately 8 percent on liquefied natural gas. 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 and Salt River Project, the two primary suppliers of electricity to the Phoenix region. Among the power generation facilities owned by Arizona Public Service 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, the Council on Environmental Quality 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 a 5 percent increase 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 MAG's travel demand model.

Direct energy consumption involves energy used for the operation of vehicles (automobile, truck or bus) in 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 use 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 by 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*, a compendium of transportation data focused on energy use. The most recent edition 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, FTA's New Starts Templates provide factors for BTU/vehicle mile for passenger vehicles and select types of transit vehicles. For this analysis, the BTU/vehicle mile factors for transit buses and light rail vehicles were derived from the *Transportation Energy Data Book*. The factor for passenger vehicles came from FTA's New Starts Templates (Table 3-26).

TABLE 3-26: ENERGY CONSUMPTION FACTORS

Mode	Horizon Year Factor (BTU/vehicle mile)
Passenger vehicles (automobiles, vans, light trucks) ^a	0.005633
Transit bus (all vehicle types) ^b	0.037105
Light rail vehicle	0.063469

Sources: Federal Transit Administration (2015), U.S. Department of Energy (2014)

Notes: BTU = British thermal unit

^a Federal Transit Administration New Starts Templates BTU/vehicle mile factor, 2015

^b The Federal Transit Administration recommends using a transit bus energy consumption factor of 37,105 BTUs/vehicle miles traveled for all bus types (including alternative fueled buses). BTUs per vehicle mile consumption factors have not been developed for alternative fuels such as compressed natural gas, liquefied natural gas, hybrid electric-gasoline vehicles and others.

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, no construction-related impacts to energy use or resources would occur. 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. Table 3-27 compares the projected annual VMT and energy consumption (in millions of BTUs) for the No-Build and Build Alternatives.

TABLE 3-27: FORECAST ANNUAL VEHICLE MILES TRAVELED AND ESTIMATED ENERGY CONSUMPTION, BY ALTERNATIVE

Alternative	Passenger Vehicles (automobiles, vans, light trucks)	Transit Bus (all vehicle types)	Light Rail Vehicle	Total
Forecast Annual Vehicle Miles Traveled				
No-Build	44,141,148,080	46,276,420	3,084,176	44,141,148,080
Build	44,114,939,538	45,349,553	3,731,248	44,114,939,538
Change	-26,208,542	-926,867	647,072	-26,208,542
Forecast Annual Energy Consumption (million BTU)				
No-Build	248,647,087	1,717,086	195,750	250,559,923
Build	248,499,454	1,682,695	236,819	250,418,968
Change	-147,633	-34,391	41,069	-140,955

Source: Maricopa Association of Governments (2014c)

Note: BTU = British thermal unit

3.9.3 Build Alternative

The Build Alternative would use electrically powered light rail vehicles, with power supplied to the vehicles by overhead wires transmitting electricity from TPSS facilities at discrete points along the alignment. These TPSS facilities convert electricity from the utility provider into the correct voltage to power the light rail vehicles and are connected to the electrical grid. The Build Alternative is in a heavily urbanized area, with several power substations near the proposed facility.

The Build Alternative would connect to the electrical grid at approximately five TPSSs to obtain a constant supply of energy, ensuring that if an electrical failure occurred at one point, the light rail system would continue receiving power. The Build Alternative would not require construction of new electrical lines or result in 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 3-27 is offset by the increase in light rail energy consumption. The decrease in passenger vehicle energy use is likely attributable to more people using light rail. Implementation of the Build Alternative would also affect transit bus vehicles by decreasing the frequency of bus service along the corridor.

Implementation of the Build Alternative is anticipated to reduce energy needs among passenger vehicles and transit bus vehicles, but would increase the energy needs for rail transit modes. 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, nonrecoverable 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 Phoenix is committed to conserving energy. As part of the SustainPHX program, the City has adopted a goal to obtain a minimum of 15 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 would 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 Phoenix 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 stations 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 Valley Metro Design Criteria Manual includes 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.

The expansion of the OMC would increase the facility's power requirements by approximately 60 percent (at build-out). Power would be needed to electrify the expanded MOE and cleaning platforms and to operate the increased fleet to and from the OMC. The existing TPSSs at the OMC could provide all the power necessary to accommodate the expansion. In April 2015, Valley Metro completed a solar plant to offset its traditional power usage, including the OMC expansion's projected usage. The

solar plant can generate 1.3 million kilowatt-hours of energy savings annually, which is equivalent to the amount of electricity required to power 123 homes. In addition, the OMC expansion would continue with the current facility's energy saving measures, such as including windows that face north or south (avoiding the hottest east and west exposures in Arizona) and have little to no heat gain—reducing cooling needs of the facility.

3.9.4 Mitigation

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

3.10 HISTORICAL AND ARCHAEOLOGICAL PROPERTIES

For additional information regarding historical and archaeological properties, refer to Appendix F, *Cultural Resource Inventory and Evaluation*.

3.10.1 Environmental Setting

On August 31, 2015, FTA initiated consultation on the proposed Build Alternative with agencies and Native American Tribes. The purpose of initial consultation is to inform interested parties of the study and to elicit information on historic and archeological resources within the study area, including traditional cultural resources that have significance.

Entities consulted are as follows: SHPO, Phoenix City Historic Preservation Office (CHPO), Phoenix Archaeology Office, Bureau of Reclamation, Salt River Project, Ak-Chin Indian Community, Fort McDowell Yavapai Nation, Gila River Indian Community, Hopi Tribe, Pascua Yaqui Tribe, Salt River Pima-Maricopa Indian Community, San Carlos Apache Tribe, Tohono O'odham Nation, Tonto Apache Tribe, White Mountain Apache Tribe, Yavapai-Apache Nation and Yavapai-Prescott Indian Tribe. Consultation will continue throughout the EA process.

Historical and archaeological resources within the proposed Build Alternative's area of potential effects (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 affected (for example, physical destruction or disturbance of any or all of the property either by the built project or during construction activities) and

What is Section 106?

Section 106 of the NHPA requires federal agencies to consider the effects of their projects on historic properties and to 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 in 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.
- After the Advisory Council on Historic Preservation sends comments to the head of the federal agency, consider the comments in deciding whether the project may proceed.

properties that may be indirectly affected (for example, 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.

FTA and Valley Metro, in consultation with the SHPO, delineated the APE for direct and indirect impacts. SHPO concurred with the APE definition on October 14, 2015. A revised APE was subsequently developed that incorporated the addition of mitigation measures on 7th Street and 7th Avenue at I-17 to accommodate increased traffic volumes resulting from the lane reduction on Central Avenue. Request for SHPO concurrence on the revised APE will be sought at the same time as FTA requests concurrence on the eligibility of historic properties for listing on the National Register of Historic Places (National Register). The request will be submitted to SHPO at the time of public distribution of the EA.

The APE for the consideration of historic properties was defined as the street ROWs along the route and the properties immediately adjacent (first tier of properties) to the Build Alternative alignment ROW. The APE also includes four detached locations where related work for the Build Alternative would take place. These include (1) property parcels adjacent to the current Central Phoenix/East Valley starter line at Central Avenue and McKinley Street for the addition of a new loop for operations flexibility, (2) the OMC where facility expansion would take place to accommodate the addition of light rail vehicles needed for the South Central Light Rail Extension and (3 and 4) the intersections of 7th Street and I-17 and 7th Avenue and I-17 where improvements are needed to accommodate changes in traffic volumes resulting from the reduction of lanes on Central Avenue. The APE for the 7th Street and I-17 intersection includes the street ROWs. The APE for the 7th Avenue and I-17 intersection includes the street ROW and one parcel of new ROW on the northwestern corner. Proposed roadway improvements at the intersection of 7th and Southern Avenues would not involve ground-disturbing activities and would have no potential for indirect effects to buildings and structures in the surrounding area; therefore, it was excluded from the APE.

Partial adjacent parcels were included for unusually large parcels, or parcels with large vacant areas or parcels where buildings adjacent to the street would screen other buildings on the parcels from impacts. The APE along the South Central Light Rail Extension alignment also includes parcels of land adjacent or near the light rail alignment for staging areas, TPSSs, signal houses and park-and-ride facilities. The APE is presented in Figures 3-12, 3-13 and 3-14.

For archaeological resources, the proposed APE includes the street ROW along the rail route and any locations outside the street ROW where ground disturbance would take place during construction, including areas for staging and temporary construction activities. Archaeological testing has not taken place within the street ROWs for the Build Alternative; therefore, the depths of cultural deposits within the APE are not known.

Archaeological excavations at sites that extend into the APE have documented artifacts and cultural deposits from the ground surface to depths of at least 6 to 8 feet (Vaughn 2008; Zyniecki 1993). In some instances, the tops of prehistoric features were encountered immediately at ground level while, for other projects, prehistoric features were not encountered until depths of 4 to 5 feet below the ground surface. For example,

Logan Simpson Design (LSD) performed archaeological monitoring for construction of the Espiritu Fields athletic field within the prehistoric site of Pueblo Viejo/ AZ T:12:73(ASM), on the eastern side of Central Avenue between Roeser Road and Cody Drive (Vaughn 2008). LSD documented 14 prehistoric features during monitoring, including two pit houses. The tops of features were situated, on average, approximately 5 feet below the ground surface. In contrast, excavations performed by SWCA, Inc., Environmental Consultants (SWCA) within the boundaries of Pueblo Viejo at El Reposo Park encountered the tops of prehistoric features immediately at ground level, including 31 cremation burials (Zyniecki 1993). Because ground-disturbing activities for the Build Alternative would extend to depths of about 20 feet below the ground surface, and the depths of cultural deposits within the APE are not known, the APE for the consideration of archaeological resources would also include a vertical depth of 20 feet.

Cultural resources within the APE are evaluated for their eligibility for listing in 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 Consideration G for “Properties that Have Achieved Significance within the Past 50 Years” if it is of exceptional importance) and must 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:

- Context of prehistory or history of the local area, state or nation
- Significance of the context of prehistory or history
- Relevance of the property type in illustrating the context
- How the property illustrates that history
- Whether 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 1974 (50 years prior to the Build Alternative estimated year of opening)—were inventoried; no properties were identified in the APE that would qualify under Criteria Consideration G.

FIGURE 3-12: AREA OF POTENTIAL EFFECTS – NORTHERN PORTION OF CORRIDOR

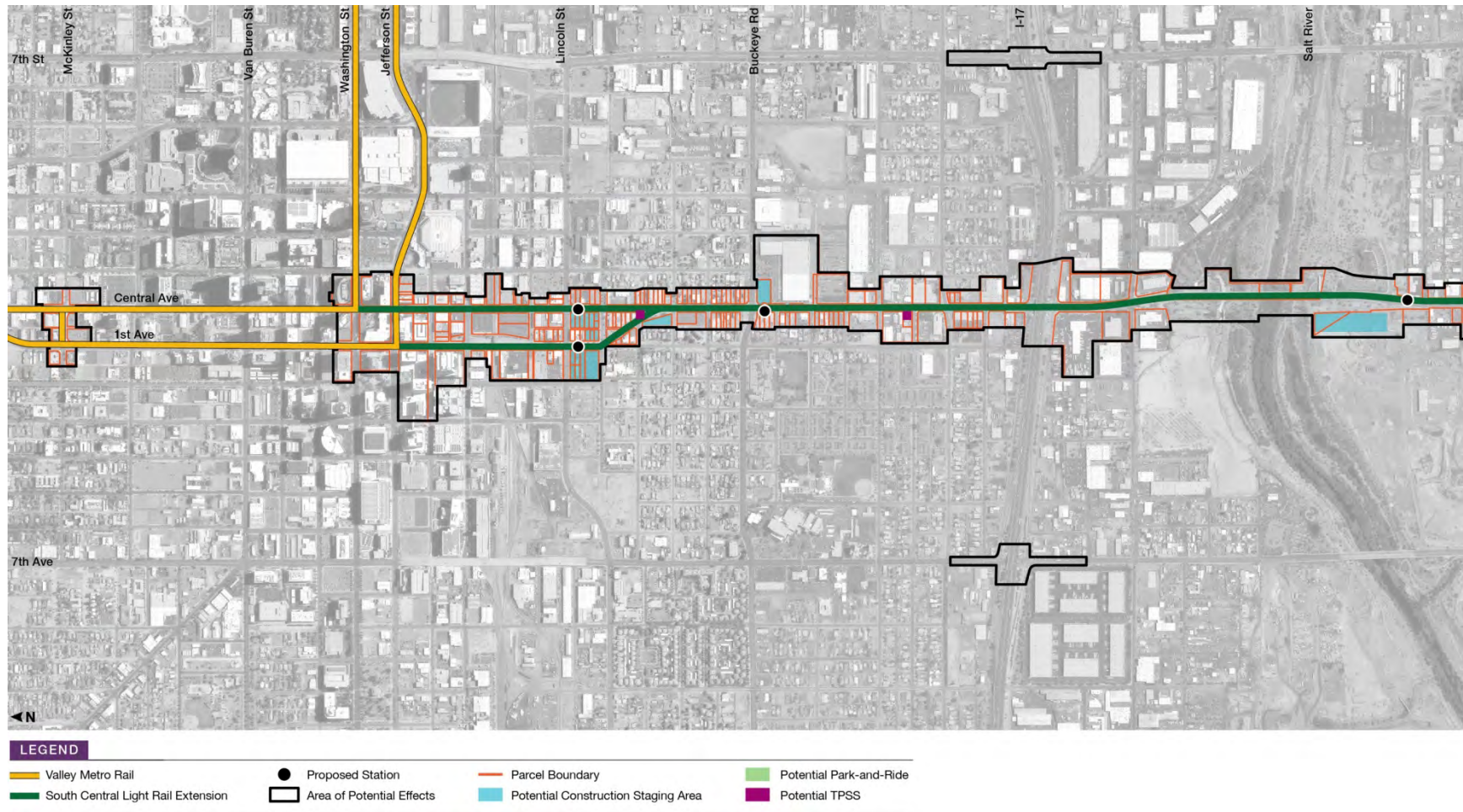
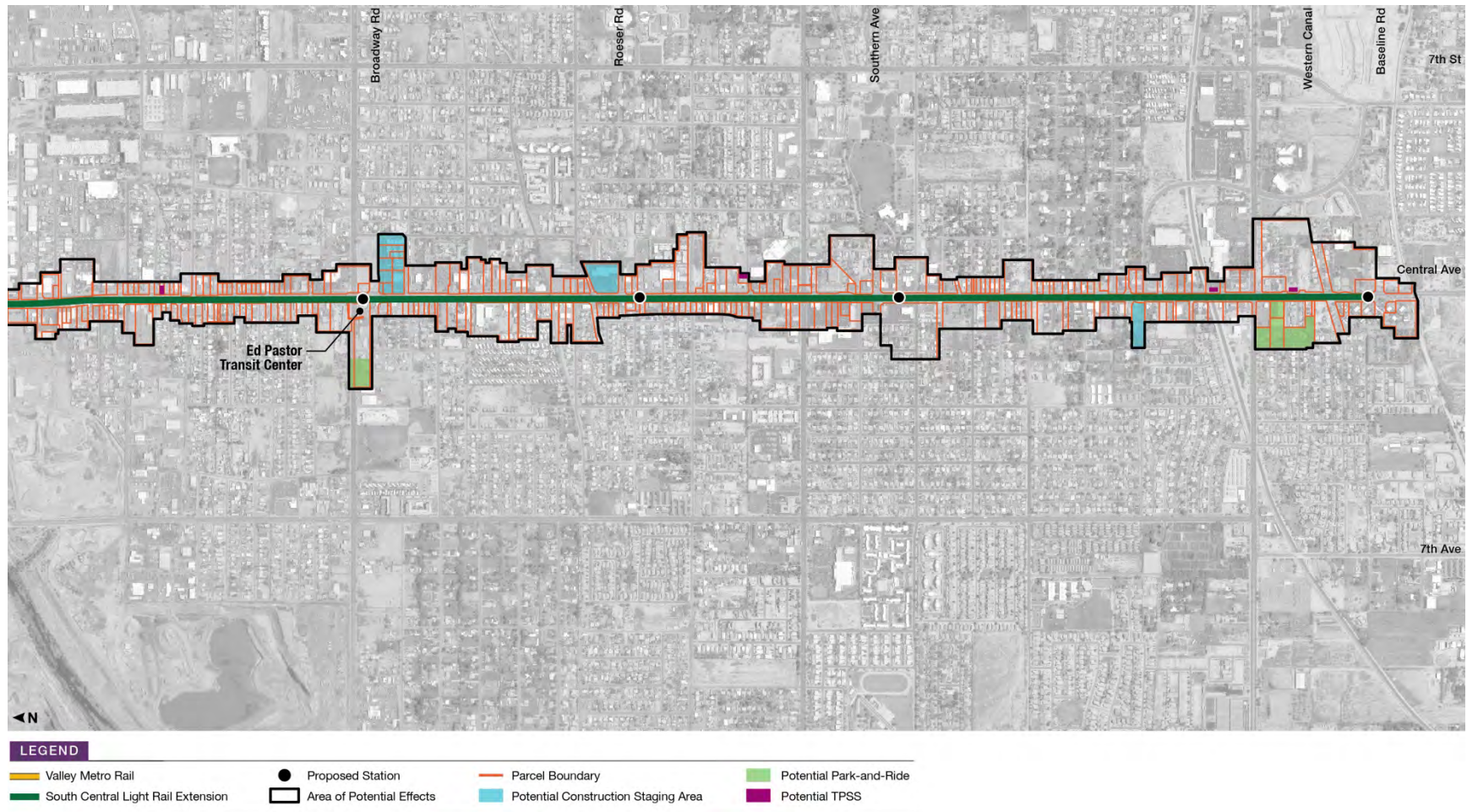
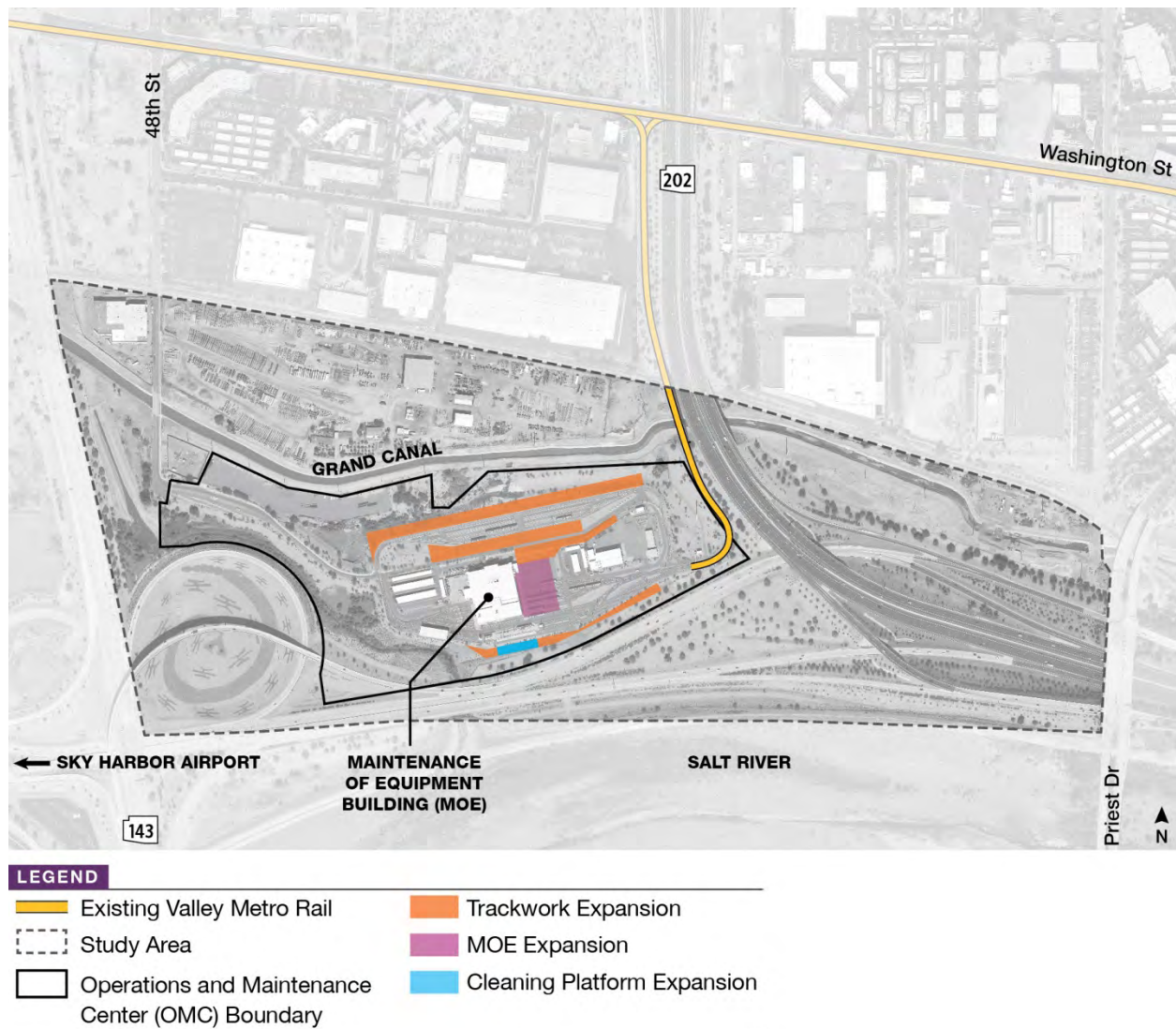


FIGURE 3-13: AREA OF POTENTIAL EFFECTS – SOUTHERN PORTION OF CORRIDOR



**FIGURE 3-14: AREA OF POTENTIAL EFFECTS
– OPERATIONS AND MAINTENANCE CENTER**



For those properties identified as listed or eligible for listing in the National Register, an evaluation of the Build Alternative's effect on such properties was then undertaken to determine whether the Build Alternative 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 CHPO. Consistent with 36 CFR 800.8, after the public review of the EA, FTA will consult with SHPO regarding the finding of effect and will request concurrence on the finding of effect to cultural resources. Where an adverse effect is identified, measures to resolve the effect would be developed, and an MOA would be prepared in consultation with SHPO, Native American groups and consulting parties to ensure appropriate treatments are implemented to minimize harm to cultural resources.

3.10.1.1 Prehistoric and Historic Overview of the Study Area

Prehistoric Period

People have lived in southern Arizona for thousands of years prior to European settlement. The prehistory of south-central Arizona is defined archaeologically by major periods of time that reflect changing adaptations and life ways over approximately 14,000 years. Those include the Paleoindian (12,000 to 8500 B.C.), Archaic (8500 to 1500 B.C.), Late Archaic/Early Agricultural (1500 B.C. to A.D. 50), Early Ceramic (A.D. 50 to 450), Hohokam (A.D. 450 to 1450), protohistoric (A.D. 1450 to 1539), Spanish (1539 to 1821), Mexican (1821 to 1848/1854) and American (post-1848/1854) periods. Prehistoric archaeological sites identified in the study area are mostly associated with the desert village-dwelling farmers known as the Hohokam, which archaeologists have investigated for more than a century.

The Hohokam culture was distinguished by the development of hierarchical settlement systems; large-scale irrigation agriculture; production of red-on-buff pottery; highly stylized artifacts made of shell, stone, and bone; wide-ranging trade networks; a highly developed burial ritual involving cremations and the development of public architecture that included ball courts and platform mounds.

Hohokam settlements were established across a large portion of Arizona. The Gila-Salt Basin is viewed as the Hohokam core area, surrounded by a number of peripheral subareas. To the north and east, peripheral areas center in the Agua Fria River, Verde River and Tonto Basin areas. Peripheries south and east include the Safford, San Pedro, Tucson Basin and Upper Santa Cruz areas. To the west and south, peripheral areas include the Gila Bend area and the eastern and western subdivisions of Papaguería.

In the Gila-Salt Basin, the Hohokam Pioneer period (circa A.D. 450 to 750) is divided into four phases—Vahki, Estrella, Sweetwater and Snaketown (Wallace 2001, 2004). Changes primarily in ceramics and architecture signal differences among the phases of the Pioneer period.

The Colonial period (circa A.D. 750 to 900 or 950) has been divided into the Gila Butte and Santa Cruz phases. It was during the Colonial period that the Hohokam built their houses in courtyard arrangements. At larger sites, courtyard house clusters defined neighborhood groups that were arranged around plazas (Howard 1985; Wilcox and others 1981). Features called ballcourts, which were focal points for community activities, were also built at the larger Colonial-period villages.

The Sacaton phase is the only phase associated with the Sedentary period (circa A.D. 900 or 950 to 1125 or 1150), but refined ceramic chronologies divide the phase into three or four subphases. The Sedentary period witnessed further expansion of settlements and canal irrigation systems and the development of various other agricultural strategies. The construction of ballcourts continued and, toward the end of the period, another type of community architecture—the platform mound—was constructed at the larger villages. Hierarchical relationships among Sedentary-period sites are recognized in the Gila-Salt and Tucson Basins (Doelle and others 1987; Gregory 1991; Howard 1987; Wilcox and Sternberg 1983).

The Classic period (circa A.D. 1125 or 1150 to 1350 or 1450) is divided into the Soho and Civano phases. The Classic period exhibits substantial changes in artifact styles, mortuary practices, settlement patterns and architecture, including adobe-walled rooms and compounds. Agricultural practices intensified in the Gila-Salt and Tucson Basins, and the Tucson Basin gained importance as a regional center at this time (Doelle and Wallace 1991).

A late Classic or post-Classic occupation, labeled the Polvorón phase, has been documented at a few sites in the Gila-Salt Basin (Chenault 1996; Crown and Sires 1984; Sires 1983). Researchers are still struggling with how to interpret this phase (Chenault 2000; Craig 1995; Henderson and Hackbarth 2000), which is notable for pit house clusters, sometimes constructed on top of apparently abandoned residential compounds and even on platform mounds. High quantities of obsidian, Salado polychrome and red-on-brown ceramics and, often, a few Hopi yellow ware ceramics are characteristic of sites dating to this period.

When European explorers entered the region in the seventeenth century, the Akimel O'odham and Tohono O'odham occupied much of south-central Arizona, and they are recognized as descendants of the Hohokam. Other groups such as the seminomadic Western Apache and Yavapai tribes occupied areas north and east of the Salt River Basin. In addition, the Hopi of northern Arizona have migration legends that trace some of their ancestors' routes through the Hohokam region of southern Arizona (Bostwick 2002).

Historic Period and Development of the Central Avenue Corridor

The City of Phoenix was established in 1870 on the northern side of the Salt River, and the conversion of land for agriculture took place both north and south of the river over the following decades. Central Avenue has been an important travel and commercial corridor since the early twentieth century. After the railroad was constructed in 1887, the area between the railroad and the Salt River was developed with industrial, commercial and residential properties. With construction of the Central Avenue bridge in 1911, Central Avenue became the primary route of travel between Phoenix and the South Mountain agricultural area and was used extensively by farmers and ranchers to bring their crops and produce to market. In the 1920s, Central Avenue was improved and residential subdivisions were platted in South Phoenix, increasing population and stimulating commercial development along Central Avenue. Beginning in 1924, tourists began using South Central Avenue to visit South Mountain Park, stimulating further commercial development along the roadway. The post-World War II population and construction boom resulted in construction of more industrial properties in the Build Alternative APE north and south of the Salt River. Platting of additional residential subdivisions in South Phoenix in the 1940s and 1950s spurred more commercial development and led to Central Avenue becoming the major commercial area for South Phoenix.

The area along the Central Avenue corridor between Downtown Phoenix and Baseline Road initially developed as a result of the construction of a railroad into Phoenix, the success of agriculture in the South Mountain area and the connection of those two areas. The following timelines outline some of the key events.

South of the Railroad Tracks to the Northern Bank of the Salt River

- 1870: The Phoenix Townsite is established.
- 1880s: Railroad construction encouraged property owners south of the railroad tracks to subdivide their land for development. Industrial and commercial businesses developed in areas closest to the railroad tracks; houses were built farther south.
- 1900 to 1939: Central Avenue north of Buchanan Street was lined primarily with industrial warehouses and commercial businesses, and the areas south of Buchanan Street to Buckeye Road were predominantly residential with interspersed commercial properties. South of Buckeye Road, industrial warehouses and commercial properties were more prevalent.
- 1940: Phoenix city boundaries had expanded north to Thomas Road, east to 24th Street and west to 25th Avenue. The southern boundary of the city was Buckeye Road west of Central Avenue and Buchanan Street east of Central Avenue.
- 1940s and 1950s: Industrial warehouses and commercial development increased along Central Avenue north of the Salt River during World War II and during the subsequent postwar population and housing boom in the 1940s and 1950s. Many of these warehouses and commercial businesses provided services associated with home building, including air conditioning manufacturing and home appliance sales and service.
- 1960s and 1970s: Industrial and commercial businesses continued to be developed along Central Avenue in the 1960s and increased in the 1970s after the southern segment of I-17 was constructed south of Durango Street.

South Phoenix – South of the Salt River to Baseline Road

- Late 1800s: Land south of the Salt River near the South Mountains was first developed for agriculture when Prescott merchant Michael Wormser acquired land from Mexican settlers in the 1870s south of the Salt River between 24th and 48th Streets.
- 1902: Congress passed the Reclamation Act, creating the U.S. Reclamation Service (now the Bureau of Reclamation) and authorizing federally funded water projects in the American West. One of the first projects authorized was Roosevelt Dam, which provided residents of the Salt River Valley with a regular water supply, attracting more settlers to the area and increasing the number of acres under cultivation.
- 1910: Bartlett-Heard and other landowners in the South Mountain area with large land holdings began to subdivide their land into tracts of 10 to 40 acres.
- 1910–1911: The Central Avenue bridge was constructed between 1910 and 1911, connecting the farming community south of the river with Phoenix and the railroad, providing an important economic link that facilitated development and growth for decades.
- 1912: Local citizens established a community center known as the Neighborhood House near the southeastern corner of 7th Street and Southern Avenue and

provided half the construction expenses; Neighborhood House served as a central meeting place for community groups.

- 1913: The U.S. Reclamation Service and local farmers partnered to construct two additional irrigation canals—the Western and Highline Canals. Most of the subdivided tracts were in an area bounded by Broadway Road to the north, Southern Avenue to the south, 7th Avenue to the west and 16th Street to the east. The population of the South Mountain area increased as the subdivided lands were purchased and cultivated.
- 1920s: Landowners began to plat residential subdivisions in the South Mountain area alongside subsistence farms and citrus tracts. Residential properties were constructed on some of the lots adjacent to Central Avenue, but as the area population grew and the use of Central Avenue as a travel corridor increased, residential parcels along Central Avenue were soon interspersed with a few commercial properties, including grocery and general merchandise stores and businesses that catered to travelers, such as filling stations.
- 1924: The City of Phoenix established South Mountain Park, and tourists began to use Central Avenue to access the park. This use of the Central Avenue travel corridor led to the establishment of a few motels, which typically consisted of small cabins constructed on an existing residential parcel.
- 1930s: The South Mountain area had numerous small farms and residential subdivisions and was establishing an identity as a rural community, which became known as South Phoenix.
- 1940s and 1950s: More residential subdivisions were developed in South Phoenix, many in the Central Avenue corridor; several churches were established on Central Avenue.
- 1960s and 1970s: South Phoenix was incorporated into the City of Phoenix and the area continued to be built out with residential subdivisions.

3.10.1.2 Archaeological Resources

Because the Build Alternative area is highly developed, the inventory of archaeological resources relied mostly on previously compiled information, with archaeological survey being limited to the proposed TPSS, staging area and park-and-ride locations where the ground surface could be inspected—a total of 9.8 acres. Evidence of one archaeological site—Pueblo Viejo, AZ T:12:73(ASM)—was identified at one of the TPSS locations near Central and Sunland Avenues.

The records review provided information on 31 archaeological sites within one-half mile of the South Central Light Rail Extension alignment. Four of the sites are within the APE and have been previously determined as eligible for listing in the National Register under Criterion D. The four sites and their site identification numbers are listed in Table 3-28.

**TABLE 3-28: PREVIOUSLY DOCUMENTED
ARCHAEOLOGICAL SITES IN THE APE**

Site Number	Description	National Register of Historic Places Eligibility, Criterion	References ^a
AZ T:12:42(ASM) Original Phoenix Townsite 7.287.SHPO	Phoenix townsite	Determined eligible, Criterion D	Cable and others 1982; Davis 2008a; Hackbarth 2012a, 2012b; Hackbarth and Gomez 2007
AZ T:12:70(ASM) Pueblo Patricio Turney Site	Hohokam village	Determined eligible, Criterion D	Bagwell 2008a; Cable and others 1983, 1985; Cable and Doyel 1985a; Cox and others 2005; Hackbarth 1995, 2010a, 2010b, 2012; Hackbarth and Gomez 2007; Henderson 1995a; Jackman and others 1999; Lindly 2005a; Montero and others 1991; Montero and Hackbarth 1992; Sorrell 2006; Turney 1929
AZ T:12:73(ASM) Pueblo Viejo	Hohokam village with platform mound and ballcourt	Determined eligible, Criterion D	Cureton 2009; Darrington and others 1993; Hart 2000; Hill and Davidson 2014; Howard and Bostwick 1991; Kennedy 2005; Lindly 2001; Shaw 2001; Stahman 2005; Steinbach 2012; Stubing and Turner 2010; Vaughn 2008; Walsh 2012; Wright 2004, 2005; Wright and others 2006; Zyniecki 1993
AZ T:12:187(ASM) Canal Seven	Prehistoric canal	Eligible, Criterion D	Luhnow 2003; Midvale 1966; Turney 1929; Vaughn 2008

^a References are in Appendix F, *Cultural Resource Inventory and Evaluation*.

The following discussion summarizes the information known about the sites based on information previously provided by others. Refer to Appendix F, *Cultural Resource Inventory and Evaluation*, for additional information about the sites and references to the archaeologists who provided the information.

Original Phoenix Townsite — AZ T:12:42(ASM)

This archaeological site was previously determined eligible under Criterion D. The original Phoenix Townsite included a 320-acre parcel of undeveloped land demarcated by the General Land Office as the northern half of Section 8, Township 1 North, Range 3 East. The boundaries for the townsite are Van Buren Street on the north, Harrison Street on the south, 7th Avenue (originally known as Yavapai Street) on the west and 7th Street (originally known as Apache Street) on the east. The town plan consisted of 98 blocks, each measuring 300 feet square. The townsite was opened to settlement in December 1870, and all the lots were sold by 1880.

Archaeological investigations have taken place at many of the townsite blocks, which included residential neighborhoods and commercial businesses. These excavations by others have provided valuable information and a unique glimpse into what life was like in the early days of Phoenix settlement and initial periods of growth and expansion.

Pueblo Patricio – AZ T:12:70(ASM)

This archaeological site was previously determined eligible under Criterion D. The APE overlaps the western edge of Pueblo Patricio, a Hohokam habitation site, although the boundaries are ambiguous. Pueblo Patricio has been the focus of numerous archaeological investigations since it was discovered in 1981. The site was first identified and mapped as early as the 1920s. At that time, the site was portrayed as having a platform mound, habitation areas and a major canal then referred to as Canal Patrick (Patricio). However, the imprecise nature of the site description and associated maps indicated that, although the site location for Pueblo Patricio is correct, it is unclear whether the platform mound and canal plotted on the map were not actually within the site of La Ciudad, 1.4 miles to the east.

In 2012, LSD performed archaeological testing and data recovery excavations for the CityScape project near the intersection of Central Avenue and Washington Street where the APE overlaps the site. Prehistoric features including pithouses, surfaces, pits and ground of postholes were documented with the tops of the features between 0.08 to 1.25 meters below modern asphalt surfaces. The excavations confirmed the presence of an Early Ceramic phase (circa A.D. 100 to 400) and Pioneer period (circa A.D. 600 to 700) Hohokam settlement, which had been observed by other researchers working in other parts of the site over the last few decades. Archaeological features associated with Pueblo Patricio could be present within the APE of the alignment, but the potential for intact archaeological deposits in the street ROW appears to be low because of the extent of prior disturbance for street construction and installation of buried utilities in the Downtown area.

Pueblo Viejo – AZ T:12:73(ASM)

Pueblo Viejo has previously been determined eligible under Criterion D. This site is a large Colonial through Classic period Hohokam village that once included a platform mound with an encircling compound, two other adobe compounds and a ballcourt. The site is on alluvial terraces approximately 1 mile south of the Salt River. A major Hohokam canal, known as Canal Seven and Canal Viejo, passed through the northern side of the site. The portion of the site within the South Central Light Rail Extension archaeological APE is along Central Avenue generally between Cody Drive and Lynne Lane. Two proposed TPSS locations and two proposed staging areas are within the site's boundaries, which are discussed below. A number of archaeological investigations have been carried out at Pueblo Viejo over the past 100 years, although the portion in the APE has not been systematically studied.

The first documented investigations of Pueblo Viejo occurred between 1897 and 1906. A mound was found at about 5 feet below the surface and appeared to be a hard floor of packed clay where many artifacts including axes, crude effigies of tufa, metates, mano stones and rings were uncovered. Three skeletons, with two of the crania preserved, were also discovered. They also found evidence showing that the top of the original structure was later leveled off, and some low rooms were constructed. This led to the belief that a wandering tribe likely later occupied the ruins, suggesting Polvorón phase (late Classic period) occupations, or reoccupations, noted elsewhere in the Salt-Gila Basin. At the top of the platform mound a hearth was discovered. Carved shell,

slate and turquoise jewelry and a spindle whorl made from a Santa Cruz or Sacaton Red-on-buff sherd were also contained within the mound.

In the 1920s, additional survey was conducted indicating that a “house mound” (platform mound) was centered directly on Central Avenue and the ballcourt was to the east, both surrounded by an extensive scattering of smaller mounds. The report indicated that no cemetery had been found at Pueblo Viejo, but did note that construction of a gasoline tank at the northwestern corner of Central and Southern Avenues uncovered the skeletons of an old man and woman with their heads oriented to the west. More recent compliance excavations have unearthed an abundance of human burials at the site. The 1920s survey report correlates the wealth of artifacts found around the turn of the century with the site’s position along a main canal, concluding that Pueblo Viejo enjoyed a constant stream of wealth in the form of water rights tribute paid by villages in less optimal positions along the canals.

Additional surveys and a few data recovery excavations occurred between the 1920s and 1990s that unearthed additional artifacts. In 1993, SWCA performed data recovery excavations at Pueblo Viejo for a planned recreation building at El Reposo Park. The project took place approximately 0.25 mile east of Central Avenue between Southern Avenue and Alta Vista Road. SWCA identified five main stratigraphic units. Strata I was a root zone consisting of the top few inches below the surface. Strata II represented the plow zone, which extended down about 25 cm. Strata III was an organic layer below the plow zone that contained cultural deposits, including a prehistoric cemetery. Strata IV and V were culturally sterile argillic and calcic layers below the cultural deposits. SWCA found that past earth-moving activities associated with construction of the park had removed Strata I and II and portions of Strata III across much of the park, which resulted in the discovery of cremation burials immediately below the ground surface.

In 2008, LSD performed archaeological monitoring at Pueblo Viejo in a 6-acre lot on the northeastern corner of Central Avenue and Roeser Road where an athletic field park was planned for development. The parcel is one location proposed as a possible construction staging area for the South Central Light Rail Extension. In addition to being within the boundaries of Pueblo Viejo, the alignment of Canal Seven passed through the Build Alternative area.

LSD documented 14 features during the monitoring for the Espiritu Field project. The identified features included two pit houses, seven likely pits of indeterminate function, one probable thermal pit and four indeterminate features. The tops of the features were encountered approximately between 4 and 5 feet below the ground surface. Charcoal-flecked cultural deposits were also noted in several construction trenches excavated in the field area for the installation of irrigation pipes; distinct features, however, were not defined. Although Canal Seven, AZ T:12:187(ASM), was projected to extend through the parcel, LSD did not detect any relict irrigation features.

Canal Seven – AZ T:12:187(ASM)

Canal Seven, also known as Canal Viejo, is a prehistoric Hohokam canal that has been recommended eligible for listing in the National Register under Criterion D. The canal alignment passes through the APE across Central Avenue between Roeser Road and Cody Drive. The canal extends over 12 miles along the southern side of the Salt River,

from its head gate near Hayden Butte in Tempe to its terminal reaches in Laveen. The canal was an important resource, providing water to Hohokam settlements and farms over a large area south of the Salt River, including Pueblo Viejo. Although LSD did not identify the canal adjacent to the APE during its monitoring for the Espiritu Field project, other archaeological investigations have confirmed the canal's presence generally on the alignment previously mapped out by Turney as described above.

Other Canals

In addition to Canal Seven, other unnamed prehistoric canal alignments were mapped by early researchers the early 1900s prior to agricultural development crossing the APE; however, their locations have not been confirmed. In addition, previously undocumented canals may be present in the APE.

3.10.1.3 Traditional Cultural Properties

Traditional cultural properties (TCPs) are historic properties eligible for inclusion in the National Register because of their association with cultural practices or beliefs of a living community that (1) are rooted in that community's history and (2) are important in maintaining the continuing cultural identity of the community (Parker and King 1998). No TCPs have been identified in the APE.

FTA, with the assistance of Valley Metro, is conducting Section 106 consultations with Native American Tribes³ to identify any potential concerns regarding effects on traditional cultural resources that may result from the proposed undertaking. As mentioned in Section 3.10.1, consultation letters were sent to Native American Tribes in August 2015, and the FTA received two written responses (the Hopi Tribe and the Gila River Indian Community). Both responses requested continued consultation, but no information on TCPs was provided. Ongoing coordination with the Native American Tribes will continue for the development of the MOA and through final design and construction.

3.10.1.4 National Register Listed and Eligible Properties within the APE

The significance and historical integrity of historic districts, buildings and structures within the APE were evaluated to determine whether they are worthy of preservation, using criteria for listing in the National Register and guidance of *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*. Eligibility recommendations were formulated on the basis of applicable, previously prepared historic contexts augmented for the Build Alternative. The historic period was defined to include properties that meet the 50-year criterion consideration of National Register eligibility when the Build Alternative is scheduled to begin operations in 2023. Accordingly, the historic period was defined as pre-1974.

The review determined that 174 historic-age properties were in the Build Alternative APE. The inventory and evaluation identified 60 properties that are listed or eligible for

³ Tribes coordinated with are Ak-Chin Indian Community, Fort McDowell Yavapai Nation, Gila River Indian Community, Hopi Tribe, Pascua Yaqui Tribe, Salt River Pima-Maricopa Indian Community, San Carlos Apache Tribe, Tohono O'odham Nation, Tonto Apache Tribe, White Mountain Apache Tribe, Yavapai-Apache Nation and Yavapai-Prescott Indian Tribe.

listing in the National Register, including 4 listed in the National Register, 6 listed in the Phoenix Historic Property Register (Phoenix Register), 17 previously evaluated as eligible for the National Register and 33 newly evaluated as eligible for the National Register. Those eligible properties included 2 districts, 3 structures and 55 individual buildings. Most of the historic properties were commercial. The eligible properties are summarized in Table 3-29; also see Appendix F, *Cultural Resource Inventory and Evaluation*.

The inventory and evaluation documented that four properties in the APE were previously evaluated as ineligible for the National Register and concluded that 110 of the previously uninventoried properties are ineligible for listing in the National Register.

3.10.2 No-Build Alternative

The No-Build Alternative would avoid adverse effects on historical and archaeological properties listed in or eligible for listing in the National Register. Some of those properties, however, could be affected under the No-Build Alternative scenario, which involves continued operation and service upgrades of the existing transportation system, programmed improvements of streets or intersections and private development and redevelopment. The impacts of those projects on historic properties would be addressed in accordance with regulations applicable to those projects.

TABLE 3-29: HISTORIC PROPERTIES AND DISTRICTS LISTED AND ELIGIBLE FOR LISTING IN THE APE

# ^a	Property Name	Address	Year Built	Status and Criteria
<i>Individual Historic Properties Listed and Eligible</i>				
1	Mehagian's Furniture Store	817 N Central Ave	1941	Eligible – Criterion C
P1	Anchor Manufacturing Co.	525 S Central Ave	1928	Listed – Criterion A; Phoenix Register
P2	Dunlap (Charles H.) House	650 N 1st Ave	1914	Listed – Criteria B and C; Phoenix Register
3	Maricopa County Courthouse/ County-City Administration Building	125 W Washington St	1928–1929	Listed – Criteria A and C; Phoenix Register, Phoenix Landmark
P4	Stoddard-Harmon House	801 N 1st Ave	1910	Listed, Criterion C; Phoenix Register
P5	Gas Works	401 S 2nd Ave	1910	Phoenix Register
P6	Jefferson Hotel	101 S Central Ave	1915	Phoenix Register
P7	Luhrs Building	11 W Jefferson St	1924	Phoenix Register
P8	Luhrs Tower	45 W Jefferson St	1929	Phoenix Register
P9	Pratt-Gilbert Building	200 S Central Ave	1913	Phoenix Register
P10	Stag Hotel	27 W Madison St	1931	Phoenix Register
11	Cooley Auto Repair/Goettl Brothers Warehouse	710–712 S Central Ave	1941	Eligible – Criterion A
P11	Cate Drugs	1001 S Central Ave	1928	Eligible – Criterion C
12	Goettl Brothers Metal Products	714 S Central Ave	1939	Eligible – Criterion A

# ^a	Property Name	Address	Year Built	Status and Criteria
P12	Central Avenue Underpass	Central Ave (Madison St to Buchanan St)	1939–1940	Eligible – Criterion C
P13	Clarence Saunder's Store #7	550 S Central Ave	1929	Eligible – Criteria A and C
P14	Corral Drive-In	6245 S Central Ave	1952	Eligible – Criterion C
15	First National Bank of Arizona, Central and Grant office	701 S Central Ave	1949	Eligible – Criterion A
P15	Electrical Shop and Supply Warehouse	231–249 S Central Ave, 10 E Jackson St	1945	Eligible – Criterion C
P16	First National Bank of Arizona Plaza/First Interstate Bank of Arizona Plaza/Wells Fargo Plaza	100 W Washington St	1971	Eligible – Criterion C
P17	Luhrs Post Office Station	25 W Jefferson St	1924	Eligible – Criterion C
19	J. H. Welsh & Son Contracting Co.	805–819 S Central Ave	1946	Eligible – Criterion C
P19	McGinnis (N. B.) Equipment Warehouse	45 W Buchanan St	1945	Eligible – Criterion C
P20	Pay n' Takit #17 Ed Pastor Transit Center	10 W Broadway Road	1936	Eligible – Criteria – A, C
P21	Phoenix Steam Laundry/ Southwest Cotton Co.	301–309 S Central Ave, 1 E Jackson St	1920	Eligible – Criterion C
22	H. Firpo Poultry House	1010 S Central Ave	1915	Eligible – Criteria A, C
P23	Southern Pacific Railroad, Phoenix Main Line AZ T:10:84(ASM)	Union Pacific Railroad	1926	Eligible – Criterion A
24	Sam's Central Service Station	1020 S Central Ave	1957	Eligible – Criterion C
P24	South Phoenix Market	4314 S Central Ave	1948	Eligible – Criterion A
25	Hughes/Fazio House	1005 S Central Ave	1918	Eligible – Criteria A, C
P25	Stewart Motor Company	800 N Central Ave	1947	Eligible – Criterion A
26	Firpo House	1009 S Central Ave	1925	Eligible – Criteria A, C
P26	Tudor Revival House	6810 S Central Ave	1925	Eligible – Criterion C
P27	Western Canal AZ T:12:154(ASM)	Salt River Project	1911–1913	Eligible (part of Salt River Project system) – Criterion A
29	Arizona Cleaning Works	1220 S Central Ave	1928	Eligible – Criterion C
30	Berg Engine Corporation	1306 S Central Ave	1930	Eligible – Criterion C
33	Phoenix Pipe and Supply	49 W Pima St	1946	Eligible – Criterion C
41	Fullerform Irrigation & Waterworks	24 E Pioneer St, 3225 S Central Ave	1954	Eligible – Criterion A
42	Globe Furniture Factory Showroom	3333 S Central Ave	1957	Eligible – Criterion C
43	Kachina Moving and Storage	3404 S Central Ave	1957	Eligible – Criterion C

# ^a	Property Name	Address	Year Built	Status and Criteria
53	Faith Temple & Retail Store	3620 S Central Ave	1945	Eligible – Criterion C, Criteria Consideration A ^b
61	Bloom's Flowers and Gift Shop	3812 S Central Ave	1957	Eligible – Criterion C
66	Pete's Fish and Chips/ C. A. Grant House	3920 S Central Ave	1957	Eligible – Criterion C
77	Central Motel	4216 S Central Ave	1910	Eligible – Criterion A
79	Strip Commercial Rental Stores	4422 S Central Ave	1950	Eligible – Criterion C
93	Mayne & DeLozier Medical Center	5410 S Central Ave	1957	Eligible – Criterion C
110	South Plaza Shopping Center	6060 S Central Ave	1961	Eligible – Criteria A, C
111	St. Catherine's Rectory	6045 S Central Ave	1947	Eligible – Criterion C
112	St. Catherine of Siena Roman Catholic Church	6200 S Central Ave	1958	Eligible – Criterion C, Criteria Consideration A
117	Kentucky Fried Chicken	6402 S Central Ave	1969	Eligible – Criterion C
121	St. Catherine of Siena Catholic School	6413 S Central Ave	1953	Eligible – Criterion C
122	Southern Baptist Temple	6520 S Central Ave	1948	Eligible – Criterion C, Criteria Consideration A
124	Dunkin's Enco Service Station	6443 S Central Ave	1961	Eligible – Criterion C
125	Lutheran Church of Hope	6600 S Central Ave	1951	Eligible – Criterion C, Criteria Consideration A
133	DeLozier Medical Office (in Roosevelt Place District)	6851 S Central Ave	1961	Eligible – Criterion C
137	South Phoenix Sunset Mortuary	7027 S Central Ave	1965	Eligible – Criterion C
139	Goemmer House	7246 S Central Ave	1927	Eligible – Criterion C
143	Baseline Medical Building	7617 S Central Ave	1966	Eligible – Criterion C
Historic Districts Eligible				
18	Maricopa County Complex Historic District	101 W Jefferson St	1964, 1977	Eligible – Criterion C
P22	Roosevelt Place Historic District	Central Ave to 7th St, Greenway Rd to Carter Rd	1927	Eligible – Criterion A

Notes: Listed in and eligible for listing in the National Register of Historic Places (National Register), Phoenix Register = Phoenix Historic Property Register

^a Numbers correspond to maps in Appendix E of the *Cultural Resource Inventory and Evaluation* report, which is found in Appendix F of this EA.

^b Criteria Consideration A applies to religious properties that are usually not considered for listing in the National Register. Even though the property type is usually excluded from the National Register, there may be special considerations or requirements that make it eligible for the National Register.

3.10.3 **Build Alternative**

3.10.3.1 **Effects on Archaeological Resources**

Direct Effects

The evaluation of archaeological resources for the South Central Light Rail Extension identified four archaeological sites within the APE that are eligible for listing in the National Register under Criterion D. It is anticipated that two sites would not be adversely affected by the Build Alternative and that two sites would be adversely affected by the Build Alternative.

AZ T:12:42(ASM) represents the remains of the original Phoenix townsite and is in the APE along Central and 1st Avenues north of Buchanan Street. Although archaeological remnants of the early town settlement have been found at numerous locations within the original townsite, there is little potential for intact historical archaeological resources in the street ROWs where the light rail extension would be constructed. Therefore, no adverse effects on the original Phoenix townsite are anticipated.

AZ T:12:70(ASM) is the prehistoric Hohokam village site Pueblo Patricio. The APE skirts the western boundary of the site north of the UPRR tracks along Central Avenue. The site's boundary is somewhat nebulous because the full extent of prehistoric features in the Downtown area has not been fully delineated. Similar to the approach for the construction of the existing light rail line through Downtown, which extended through Pueblo Patricio along Jefferson and Washington Streets within similar contexts (URS Corporation 2004a, 2004b, 2005), an archaeological monitor is recommended for ground-disturbing activities in this area as a precaution.

AZ T:12:73(ASM) is Pueblo Viejo, a large Hohokam village in the Build Alternative area south of the Salt River. Based on historical records, a platform mound was situated within or adjacent to Central Avenue, which was constructed in the late 1890s and has remained a roadway ever since. Although the portion of the site within the APE has been affected by road construction and utility work, there is potential for well-preserved cultural deposits and features. The presence, depth and condition of cultural deposits within the Central Avenue ROW are not known given the paucity of prior subsurface investigations. However, based on the results of data recovery excavations nearby and the abundance of human remains encountered by other investigations, the archaeological evaluation concluded that the Build Alternative would adversely affect the historic property given the proposed scope of work.

In terms of intensity of impacts, less the 3 percent of the Pueblo Viejo site is within the construction footprint of the Build Alternative, and, while archaeological deposits are anticipated to be present, impacts of prior road construction and utility installations are likely to have degraded the archaeological integrity of those deposits to a degree.

A treatment plan will be developed and implemented as mitigation to minimize impacts from the Build Alternative. This would include a plan for archaeological testing and data recovery integrated with a program of public outreach, tribal participation and data gathering that would contribute to the collective traditional knowledge of culturally affiliated Native American Tribes.

AZ T:12:187(ASM) is Canal Seven, also known as Canal Viejo, a prehistoric Hohokam canal. The historically documented alignment of the canal has been verified outside the APE by other projects and it is expected to be encountered within the APE. The archaeological evaluation concluded that, given the proposed scope of work, the Build Alternative would adversely affect the historic property. The treatment plan developed and implemented for the Build Alternative would include mitigation measures to minimize impacts to the site through archaeological testing and data recovery.

Other Build Alternative Components

Expansion of the OMC facilities would not require new ROW. No archaeological sites are present within the expansion footprint; therefore, no direct or indirect effects to historic properties would result from the Build Alternative. The historic Grand Canal adjacent to the northern side of the OMC and remnants of the historic Joint Head Division Dam headgate, which were preserved in place when the OMC was constructed, are outside the APE and would not be affected.

The South Central Light Rail Extension would entail some roadway modifications at the intersections of 7th Avenue and I-17, 7th Street and I-17 and 7th and Southern Avenues where traffic patterns would be affected by the lane reduction on Central Avenue. No archaeological sites have been identified within in the APE and no ground-disturbing activities would occur at the 7th Avenue and Southern Avenue intersection.

No TCPs have been identified within the Build Alternative area; therefore, no direct or indirect effects would result from the Build Alternative. FTA, with the assistance of Valley Metro, is conducting Section 106 consultations with Native American Tribes to identify any potential concerns regarding effects on traditional cultural resources that may result from the proposed undertaking. Ongoing coordination with the Native American Tribes will continue for the development of the MOA and through final design and construction.

Indirect Effects

The Build Alternative would not have an indirect effect on archaeological resources.

3.10.3.2 Effects on Historic Properties

Direct Effects

The Build Alternative is nearly entirely within the existing street curbs with the exception of minimal ROW acquisitions to accommodate light rail stations, TPSS facilities needed to provide electric power to operate the light rail, widening of the major traffic intersections and the two park-and-ride facilities. ROW takes on parcels containing historic properties would not result in impacts to the buildings or structures. The ROW takes would be minor, would not consist of any contributing elements that qualify the property as eligible for the National Register and would not adversely affect the historic settings or architectural features of those properties. The Build Alternative would not result in the physical destruction of, damage to, removal or alteration of or transfer/sale/lease of any historic buildings and structures listed in or eligible for listing in the National Register. Once constructed, operation of the system is not expected to

have additional impacts on historic districts, buildings and structures. 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.

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.

The Build Alternative is located within an important travel and commercial corridor since the early twentieth century. This transportation corridor contains traffic signals, street lights, overhead 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 stations would result in minimal changes to the landscape and would not introduce structures taller than existing buildings and street features or a massing effect to the visual character of any historic properties or district. Although the catenary wires and poles would be more noticeable than the tracks, they would be of a scale similar to that of the existing street lighting and overhead utility poles. The addition of these new light rail 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 or character of the ROW (Section 3.12). Therefore, the project would have no adverse visual impact that would diminish the integrity of the features qualifying the properties for eligibility for listing in the National Register.

The Build Alternative could increase noise and groundborne vibration levels at National Register-listed and eligible historic buildings and structures adjacent to the alignment. The noise and vibration analysis presented in Section 3.8 evaluated impacts based on FTA criteria, which consider annoyance. Section 3.8.4 discusses mitigation measures and concludes that the measures presented would result in no adverse noise or vibration impacts anywhere along the route based on FTA criteria. In addition, the vibration analysis considered the potential for damage to sensitive buildings and structures. The FTA guidance for risk to buildings extremely susceptible to damage is 90 VdB, which is 18 decibels higher than the annoyance vibration limit for Category 2 (residential) land uses. Vibration from light rail operations would be well below the limit for risk to buildings extremely susceptible to damage at all historic resources. Therefore, the project would have no adverse noise or vibration impact that would diminish the integrity of the features qualifying the properties for eligibility for listing in the National Register.

Expansion of the OMC facilities would not require new ROW. No historic resources are present; therefore, no direct or indirect effects to historic properties would result from the Build Alternative.

The Build Alternative would entail some roadway modifications at the intersections of 7th Avenue and I-17, 7th Street and I-17 and 7th and Southern Avenues where traffic patterns would be affected by the lane reduction on Central Avenue. No historic buildings or structures are on the property parcel where the new ROW would be acquired. Because no historic properties or structures have been identified in the APE in

these areas and there would be no ground-disturbing activities at the 7th and Southern Avenue intersection, there is no potential for indirect effects to these resources.

In summary, although the Build Alternative would directly affect several properties, it would not affect the historic buildings or structures themselves. The acquisition of land would not affect the characteristics of the historic properties that qualify those properties for inclusion in the National Register in a manner that would diminish their integrity. There are no indirect impacts on historic resources. Therefore, the Build Alternative is expected overall to have no adverse effect on historic properties within the APE.

3.10.4 Measures to Avoid and Minimize Effects

3.10.4.1 Historic Properties

Sixty National Register-eligible historical properties are within the APE for the Build Alternative. Fifteen parcels containing historical buildings would require minor ROW acquisitions; however, this would not adversely affect their features or ability to convey historical significance.

Indirect effects would include visual, noise and vibration impacts:

- No indirect adverse effects would result from visual intrusion. As discussed in Section 3.12.3, the project route travels within an important travel and commercial corridor since the early twentieth century. The addition of new light rail project elements would be consistent with the existing urban character along the corridor and, therefore, would not introduce an adverse effect or disruption of the historic setting or character of the ROW. Therefore, the project would have no adverse visual impact that would diminish the integrity of the features qualifying the properties for eligibility for listing in the National Register.
- With implementation of the noise mitigation strategies for light rail operations presented in Section 3.8.4, there would be no adverse noise effects to noise-sensitive uses anywhere along the route. The mitigation measures would not affect the character or setting of the historic properties and thus would not diminish their eligibility for the National Register.
- Construction noise impacts are possible at almost any location along the proposed light rail route. However, these impacts would be short-term in nature and would end upon construction completion. Given the short-term nature of the possible adverse construction noise effects and the measures presented in Section 3.20 to minimize the adverse effects, the effects would not affect the character or setting of the historic properties and thus would not diminish their eligibility for the National Register.
- It is not anticipated that operation or construction vibration would be at levels that could potentially risk damage to fragile buildings; however, as a precautionary measure, preconstruction surveys of historical buildings or other potentially fragile buildings within approximately 200 feet of the construction would be conducted.

Construction and operation of the Build Alternative would have no adverse direct or indirect impacts on historic districts, buildings and structures in the APE; therefore, no measures to minimize and avoid effects are required.

3.10.4.2 Archaeological Resources

Four archaeological sites are in the APE, and all are eligible for the National Register under Criterion D (SHPO concurrence regarding their eligibility will be requested at the time of public distribution of this EA):

- Adverse effect on AZ T:12:73(ASM), Pueblo Viejo, and AZ T:12:187(ASM), Canal Seven
- No adverse effect on AZ T:12:70(ASM), Pueblo Patricio, but would require monitoring given its boundary's proximity to the Build Alternative
- No adverse effect on AZ T:12:42(ASM), the Original Phoenix Townsite

There would be an adverse effect on Pueblo Viejo and Canal Seven; however, with the implementation of mitigation measures, the impact would be minimized. FTA will request SHPO concurrence with the findings of effect after the EA public review period is completed.

In response to enactment of historic preservation laws and regulations, the adverse effects of development on these types of archaeological sites have been routinely resolved over the last four decades through archaeological investigations rather than preservation in place. Although the disturbance of human burials associated with Hohokam village sites are of concern to the Tribes that have traditional cultural associations with the sites, burials are routinely recovered, documented and repatriated to affiliated Tribes, who have come to perceive the process as an inevitable aspect of urban growth. For example, approximately 1,000 burials have been recovered and repatriated from the Las Canopas site approximately 4 miles east of Pueblo Viejo to accommodate residential and commercial development.

Within the context of the Phoenix metropolitan area and the Salt River Valley, mitigation of the impacts of urban development (including prior light rail projects) on Hohokam archaeological sites through archaeological data recovery studies is viewed as adequate and would not constitute a significant impact that would warrant preparation of an environmental impact statement pursuant to NEPA. In terms of intensity of impacts, less than 3 percent of the Pueblo Viejo site is within the construction footprint of the light rail project, and, while archaeological deposits are anticipated to be present, impacts of prior road construction and utility installations are likely to have degraded the archaeological integrity of those deposits. Preservation in place is not a reasonable or practical option for treatment of the site within the APE given its location within a primary city street that requires ongoing roadway maintenance, utility work, and other ground-disturbing activities. Because of the degree of disturbance, any archaeological remains in the APE would not retain exceptional qualities that warrant attempts to preserve them in place, particularly because the vast majority of the site is on privately owned land and those landowners are unlikely to have any motivation for preserving in place the parts of the site that might remain partially intact on their land.

Pueblo Viejo was an important Hohokam village that was largely destroyed early in the twentieth century by agricultural and then urban development. As a result, few archaeological studies have been conducted at the site and relatively little is known about the site, especially in comparison with some of the other large Hohokam village

sites in the Salt River Valley. Archaeological investigations conducted as mitigation to minimize the impacts of the South Central Light Rail Extension would provide an opportunity to collect and preserve artifacts and gather important information that would further the understanding of Hohokam prehistory, enhance the collective traditional knowledge of Native American Tribes and broaden the perspective of modern Phoenixians on their lives as a continuation of the deep history of settlement in the Sonoran Desert. Furthermore, while avoidance of human remains is always the preferred option for Native American Tribes, archaeological excavations would allow for the safe recovery and repatriation of burials and associated funerary items from a context prone to future ground-disturbing activities and possible destruction.

Prior to FTA issuing a decision document for the Build Alternative, Valley Metro and FTA would work with SHPO, CHPO, Native American Tribes and other consulting parties to prepare and execute a Section 106 MOA (see Appendix F1) and to develop and implement a Treatment Plan as mitigation to minimize the impacts of the Build Alternative on historic properties. Native American Tribes would be included in the development and implementation of the MOA and Treatment Plan and subsequent research, fieldwork and interpretation of results, especially at it pertains to the collection and dissemination of data that will contribute to the collective traditional knowledge of Native American Tribes culturally affiliated with the study area. The Treatment Plan would include the following:

- Archaeological testing and data recovery at Pueblo Viejo/AZ T:12:73(ASM) and Canal Seven/AZ T:12:187(ASM)
- Procedures for any discovery situations, including the treatment of human remains
- Monitoring at Pueblo Patricio/AZ T:12:70(ASM)

3.11 SECTION 4(f) AND SECTION 6(f) EVALUATION

For additional information regarding Section 4(f) and Section 6(f) properties, refer to Appendix G, *Section 4(f) and Section 6(f) Technical Memorandum*.

3.11.1 Environmental Setting

Section 4(f) of the U.S. Department of Transportation Act of 1966, as amended, states that FTA “may approve a transportation program or project ... requiring the use of publicly owned land of a public park, 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, refuge, or site) only if (1) there is no prudent and feasible alternative to using that land; and (2) the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use” (49 United States Code [USC] 303); or (3) only if FTA determines that the use of the property, including any measure(s) to minimize harm (such as any avoidance, minimization, mitigation or enhancement measures) will have a *de minimis* impact on the Section 4(f) resource. Section 4(f) applies to historic and archaeological sites that are listed in or eligible for listing in the National Register and that warrant preservation in place, subject to certain exceptions as determined by FTA.

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.

Three city parks—Central Park, Hayden Park and El Reposo Park—have received LWCF monies and are thus Section 6(f) resources (Figure 3-15). None of these Section 6(f) resources are along the alignment or adjacent to any of the proposed Build Alternative features. Central Park, the closest Section 6(f) resource to the alignment/Build Alternative features, is approximately 0.10 mile away.

Public properties (including but not limited to city, county, state and public school property) were reviewed in order to identify publicly owned parks and recreational areas in the vicinity of the Build Alternative corridor that would be considered Section 4(f) recreational resources.

No Section 4(f) resources within the Build Alternative corridor are considered wildlife and waterfowl refuges. The study area has seven City of Phoenix-owned parks and recreational areas: Grant Park, Central Park, Harmon Park, Hayden Park, El Reposo Park, Ho-E Min Park and Momo Mini Park.

The Sonoran Bikeway is a specially designated route that connects South Mountain Park and the Phoenix Sonoran Preserve (about 40 miles total). Although the Sonoran Bikeway has a recreational component, it is exclusively within existing streets and the transportation network. The City of Phoenix 2014 Comprehensive Bicycle Master Plan “designates bicycle facilities into two functional categories: recreational paths within city parks, desert preserves, which are generally implemented and maintained by the Parks and Recreation Department; and commuter/transportation-related facilities located within street corridors under the jurisdiction of the Street Transportation Department and along canals under the jurisdiction of Salt River Project.” According to this definition in the Comprehensive Bike Master Plan, the Sonoran Bikeway is designated as primarily a commuter/transportation facility within street corridors and, therefore, it is not considered a Section 4(f) resource.

The study area has nine schools with outdoor recreational amenities: Lowell Elementary School, Friendly House Academia del Pueblo Elementary, Cesar E. Chavez Community School, Reyes Maria Ruiz Leadership Academy, Esperanza Montessori Academy, St. Catherine of Siena Catholic School, South Pointe Junior High School, Champion South Mountain School and Phoenix Collegiate Academy. Eight of the schools are closed to the general public for recreational purposes; therefore, these eight schools do not meet the definition of a Section 4(f) resource. In addition, five of the nine schools (Lowell Elementary School, Friendly House Academia del Pueblo Elementary, Cesar E. Chavez Community School, South Pointe Junior High School and Champion South Mountain School) are not along the alignment or adjacent to any of the Build Alternative features. The ninth school, Phoenix Collegiate Academy, is privately owned and thus does not meet the definition of a Section 4(f) resource.

**FIGURE 3-15: SECTION 4(f) AND SECTION 6(f) RESOURCES
ADJACENT TO THE BUILD ALTERNATIVE**



Historical properties that qualify as Section 4(f) resources occur along the alignment or adjacent to Build Alternative features. They include 58 buildings or structures listed in or eligible for listing in the National Register and 2 historic districts (Maricopa County Complex Historic District and Roosevelt Place Historic District). Four archaeological sites (see Table 3-28 in Section 3.10) in the study area are eligible for the National Register based on their information potential (Criterion D); in other words, this criterion applies to properties that have yielded, or may be likely to yield, information important in prehistory or history and what can be gained through data recovery (see Table 3-28). SHPO concurrence on eligibility is pending, and concurrence will be obtained prior to FTA issuance of a finding of no significant impact for the EA. Because these sites have minimal value for protection in place per 23 CFR 774.13(b)(2), Section 4(f) does not apply to them. Section 3.10.4.2 provides additional information regarding why protection in place is not warranted.

Additional information about historical and archaeological resources subject to Section 4(f) and potential effects and uses is provided in Section 3.10 and in Appendix G, *Section 4(f) and Section 6(f) Technical Memorandum*, and Appendix F, *Cultural Resource Inventory and Evaluation*.

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

3.11.3.1 Section 6(f) Resources

The Build Alternative contains three parks (Central Park, Hayden Park and El Reposo Park) that have received LWCF funds and are considered Section 6(f) resources. None of these Section 6(f) resources are along the alignment or adjacent to any of the proposed Build Alternative features. Central Park, the closest Section 6(f) resource to the alignment/Build Alternative features is approximately 0.10 mile away. Therefore, the Build Alternative would not result in the acquisition or conversion of any portion of any Section 6(f) resources for the proposed transit facility. Therefore, the Build Alternative would not affect any resources subject to Section 6(f).

3.11.3.2 Direct Use of Section 4(f) Properties

A direct use of a Section 4(f) resource occurs when any portion of the resource is converted to a transportation use. In some cases, the direct use may be minor, or *de minimis*. As defined in 23 CFR 774.17(5), a *de minimis* impact for historic sites means that FTA has determined, in accordance with 36 CFR Part 800, that no historic property would be affected by the project or that the project would have no adverse effect on the historic property in question. For parks, recreation areas and wildlife and waterfowl refuges, a *de minimis* impact is one that would not adversely affect the features, attributes or activities qualifying the property for protection under Section 4(f). The requirements of Section 4(f) would be considered satisfied if it is determined that the

project would have only a “*de minimis* impact” on the Section 4(f) resource. The provision allows avoidance, minimization and mitigation or enhancement measures to be considered in making a *de minimis* determination.

The Build Alternative would not result in a direct use of any Section 4(f) City of Phoenix-owned park and recreational area because none of these resources are adjacent to the alignment or any Build Alternative features. The nearest park to the proposed alignment is Central Park, which is 0.10 mile from the proposed Build Alternative.

The Build Alternative would, however, require partial acquisition of 15 historic properties (Table 3-30). The partial acquisition would not alter the architectural features or the ability of the structures or buildings to convey historical significance. The partial acquisitions are limited to areas adjacent to parking lots, yards and landscaped areas, which do not contribute to the eligibility of the resource for listing in the National Register. Therefore, the Build Alternative would result in *de minimis* impacts to historic resources protected under Section 4(f). For additional information on acquisitions, see Section 3.1 and Appendix A.

No other direct uses of Section 4(f) resources would occur.

During construction, unknown archaeological resources (unanticipated discoveries) determined eligible for listing in the National Register could be encountered, including those warranting preservation in place. At this time, no archaeological resources protected under Section 4(f) are in the study area; therefore, no use of these resources is anticipated. If archaeological resources are encountered inadvertently during construction, are determined to be eligible for listing in the National Register and warrant preservation in place, Valley Metro would prepare separate Section 4(f) evaluations for such resources according to 23 CFR 774.9(f). The Section 4(f) process would be expedited, including the consultation with other agencies, such as SHPO. The process would include evaluation of feasible and prudent avoidance alternatives. For archaeological resources, preservation of resources in place through avoidance would be accomplished whenever feasible.

TABLE 3-30: *DE MINIMIS* IMPACTS ON SECTION 4(f) RESOURCES

Resource Name	Location	Description of Impact ^a
Corral Drive Inn	6249 S Central Ave	• No impact to the building. The land does not contribute to the eligibility of the resource. • Approximately 102 square feet, or 1.3 percent of the total property, would be converted to a transportation use. • Minor use of land would be from the southwest corner of the parking lot adjacent to the existing sidewalk.
Tudor Revival House	6810 S Central Ave	• No impact to the building. The land, including the parking lot, does not contribute to the eligibility of the resource. • Approximately 888 square feet, or 1.2 percent of the total property, would be converted to a transportation use. • Minor use of land from the parking lot would occur.

Resource Name	Location	Description of Impact ^a
Hughes/Fazio House	1005 S Central Ave	• No impact to the building. The land does not contribute to the eligibility of the resource. • Approximately 117 square feet, or 1.6 percent of the total property, would be converted to a transportation use. • Minor use of land would be from the front yard of the house.
Firpo House	1009 S Central Ave	• No impact to the building. The land does not contribute to the eligibility of the resource. • Approximately 232 square feet, or 3.3 percent of the total property, would be converted to a transportation use. • Minor use of land would be from the front yard of the house.
Phoenix Pipe and Supply	49 W Pima St	• No impact to the building. The land does not contribute to the eligibility of the resource. • Approximately 368 square feet, or 0.5 percent of the total property, would be converted to a transportation use. • Minor use of land would be from a narrow strip of a paved lot.
Fullerform Irrigation & Waterworks	24 E Pioneer St and 3225 S Central Ave	• No impact to the building. The land does not contribute to the eligibility of the resource. • Approximately 221 square feet, or 0.6 percent from one parcel, and 496 square feet, or 2.9 percent from the other, would be converted to a transportation use. • Minor use of the paved corner of each of the lots would occur.
Globe Furniture Factory Showroom	3333 S Central Ave	• No impact to the building. The land, including the parking lot, does not contribute to the eligibility of the resource. • Approximately 1,232 square feet, or 5.1 percent of the total property, would be converted to a transportation use. • Minor use of land from the corner of a parking lot would occur.
Kachina Moving and Storage	3404 S Central Ave	• No impact to the building. The land, including the parking lot, does not contribute to the eligibility of the resource. • Approximately 1,650 square feet, or 5.5 percent of the total property, would be converted to a transportation use. • Minor use of the corner of the parking lot would occur.
South Plaza Shopping Center	6060 S Central Ave	• No impact to the building. The land does not contribute to the eligibility of the resource. • Approximately 1,135 square feet of the parking lot adjacent to Central Ave, or 0.03 percent of the total property, would be converted to a transportation use. • Minor use of the parking lot adjacent to the proposed Southern Ave/Central Ave Station would occur.

Resource Name	Location	Description of Impact ^a
St. Catherine of Siena Roman Catholic Church	6200 S Central Ave	- No impact to the building. The land, including the parking lot, does not contribute to the eligibility of the resource. - Approximately 1,224 square feet, or 1.07 percent of the total property, would be converted to a transportation use. - Minor use of a narrow strip of parking lot would occur.
St. Catherine of Siena Catholic School	6413 S Central Ave	- No impact to the building. The land, including the parking lot, does not contribute to the eligibility of the resource. - Approximately 2,022 square feet, or 1.19 percent of the total property, would be converted to a transportation use. - Minor use of a corner of the property and a narrow strip of parking lot.
Lutheran Church of Hope	6600 S Central Ave	- No impact to the building. The land, including the parking lot, does not contribute to the eligibility of the resource. - Approximately 309 square feet, or 0.26 percent of the total property, would be converted to a transportation use. - Minor use of a narrow strip of parking lot would occur.
Goemmer House	7246 S Central Ave	- No impact to the building. - Approximately 1,872 square feet from the “yard” of the house and 15,188 square feet from the vacant back lot (47.9 percent of the total property) would be acquired for the end-of-line park-and-ride. - While the percentage of land that would be acquired is relatively large, the land does not contribute to the resource’s National Register eligibility and thus constitutes a <i>de minimis</i> impact on the historic property.
Baseline Medical Building	7617 S Central Ave	- No impact to the building. The land, including the parking lot, does not contribute to the eligibility of the resource. - Approximately 55 square feet, or 0.51 percent of the total property, would be converted to a transportation use. - Minor use of a narrow strip of parking lot would occur.
Kentucky Fried Chicken	6402 S Central Ave	- No impact to the building. The land, including the parking lot, does not contribute to the eligibility of the resource. - Approximately 331 square feet, or 2.89 percent of the total property, would be converted to a transportation use. - Minor use of the corner of the parking lot would occur.

^a State Historic Preservation Office concurrence on eligibility and effect is pending.

3.11.3.3 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 (for example, 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.⁴

⁴ When a direct use of a Section 4(f) resource would occur, proximity impact analysis to determine whether constructive use of the resource would occur is no longer applicable (23 CFR 774.15).

Access Impacts

The proposed Build Alternative would not change how Section 4(f) properties are currently accessed because no driveways or parking lots used to access Section 4(f) properties would be eliminated. Therefore, access would be maintained. In addition, the Build Alternative would enhance access to Section 4(f) resources near the alignment through provision of a convenient and reliable transportation option that provides increased and improved access to transit passengers in the portion of the region served by the light rail system.

Visual Impacts

The Build Alternative would introduce new visual elements, such as light rail stations, trackwork, overhead catenary poles and wires and TPSS structures into the existing visual setting. The Build Alternative would not substantially alter the general urban visual character. The track would introduce a new linear element into the roadway but would not disrupt the visual context. The elements of the Build Alternative would be consistent with the existing urban setting, so it would not adversely affect the visual setting or impair activities, features or attributes of the property that qualify it for protection under Section 4(f). Therefore, no constructive use would occur.

No visual impacts on Section 4(f) historic resources would occur. The at-grade trackways would result in minimal changes to the landscape. The overhead catenary wires and poles would be more noticeable than the tracks but generally of a scale similar to that of existing street lighting and overhead utility poles. The stations, TPSSs and signal houses would not have adverse visual impacts on the architectural characteristics that make the historic buildings eligible for the National Register. The stations, TPSSs and signal houses would not have adverse visual impacts on the architectural characteristics that make the historic buildings eligible for the National Register. The TPSSs would be custom-designed to fit into the character of the surrounding area (for example, constructed of brick, stucco or whatever material is appropriate for the setting) and would include landscaping placed around the structure. TPSSs, signal houses and stations would fit into the context of the surrounding area and would not change the area's character or feel. Furthermore, the current setting of the historic properties does not contribute to the resources' historic value.

Although no measures to minimize harm are necessary since the Build Alternative would not result in visual and aesthetic impacts, the Build Alternative's final design would incorporate specific aesthetic guidelines for stations' platforms, TPSSs, overhead catenary poles and wires and track, where possible. The Build Alternative would conform to guidance and specifications in the *Urban Design Guidelines* (2001), *METRO Central Mesa LRT Extension Urban Design Guidelines* (2010) and Valley Metro's applicable design criteria for stations, landscape, etc. These documents include methods to enhance and maintain urban continuity and to blend the Build Alternative's features into the existing setting. Methods that could be adopted are:

- Integrate new facilities with area redevelopment plans.
- Minimize the height of facilities to the extent possible to reduce their visibility.
- Use light fixtures that would not cause light spillover into residential areas.

- Carefully select TPSS sites and customize them using building materials and architectural styles that are compatible with the surrounding environment.
- Provide new landscape to create continuity throughout the Build Alternative area.

Noise Impacts

The Build Alternative would not interfere with noise-sensitive activities such as:

- Hearing performances at an outdoor amphitheater
- Sleeping in the sleeping area of a campground
- Enjoying a historic site where a quiet setting is a generally recognized feature or attribute of the site's significance
- Enjoying an urban park where serenity and quiet are significant attributes

These activities do not occur in the study area. Section 4(f) parks along the proposed light rail alignment do not have noise-sensitive activities that contribute to their importance as Section 4(f) resources.

Two Section 4(f) historic properties, Goemmer House (7246 South Central Avenue) and Central Hotel (4216 South Central Avenue) are immediately adjacent to the Build Alternative (see Section 3.8). At the Central Hotel, train bells (as the light rail vehicle approaches the nearby station) are predicted to exceed FTA's moderate impact criteria by less than 1 dB,⁵ while at Goemmer House the train bells and nearby special trackwork have the potential to create moderate noise impacts. While there may be moderate noise impacts in the area of these Section 4(f) historic properties, a quiet setting is not a recognized feature or attribute of the site's historical significance.

Measures to reduce noise impacts on Goemmer House below the applicable FTA noise criteria for annoyance would be implemented by Valley Metro as described in Section 3.8.4. Valley Metro includes friction control in all of its light rail designs to reduce the occurrence of wheel squeal, which would also reduce noise impacts. Even without implementation of the mitigation stated in Section 3.8.4, the impact would not be so severe as to diminish the qualities that make these historic resources eligible for the National Register; therefore, no constructive use would occur.

Vibration Impacts

Special trackwork adjacent to the Goemmer House (7246 South Central Avenue), Jefferson Hotel (101 South Central Avenue) and Cate Drugs (1001 South Central Avenue) would result in vibration impacts based on FTA thresholds for annoyance. Groundborne vibration impacts could also occur at Firpo House (1009 South Central Avenue) from light rail vehicles. These impacts, even without mitigation measures described in Section 3.8.4, would not be so severe as to damage the structures. The FTA guidance for risk to buildings extremely susceptible to damage is 90 VdB. The vibration levels would not exceed this risk threshold for building damage, although they

⁵ Mitigation would not be implemented for exceedances less than 1 dB. In the case of train bells at stations causing a less than 1-dB exceedance, these bells are safety-related and already at a low level setting, so no mitigation is warranted.

may exceed the FTA thresholds for minor human annoyance. Therefore, the impact would not be so severe as to diminish the qualities that make the properties eligible for the National Register; therefore, no constructive use of these properties would occur.

Three historic towers—the Luhrs Tower and Luhrs Building (both at 11 West Jefferson Street) and the Barrister Place building (101 South Central Avenue)—are between 21 and 36 feet from the nearest track. Although these buildings are historic, they are not necessarily extremely sensitive to damage from vibration. In addition, the predicted vibration levels from construction equipment do not exceed the construction vibration limit for these buildings (see Section 6.2 of the Noise and Vibration Technical Report in Appendix E). Therefore, no adverse effect from vibration damage is predicted for the Luhrs Tower, Luhrs Building or the Barrister Place building; however, all should be included in the preconstruction survey to document current conditions.

It should be noted that Barrister Place would potentially be redeveloped as a mixed use site with a residential component and would receive vibration mitigation to minimize annoyance to future residents, not because of potential damage to historic buildings.

3.11.3.4 Temporary Occupancy of Section 4(f) Properties

No temporary occupancy of any Section 4(f) properties would occur because no construction staging or TCEs would occur on any Section 4(f) resource. Furthermore, access to these properties would not 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. Throughout the Section 4(f) process, Valley Metro has strived to reduce ROW acquisition at Section 4(f) properties. ROW acquisition has been minimized to the extent possible. All planning to minimize harm was undertaken. For the 15 historic properties where partial acquisitions would occur, only *de minimis* impacts would result. After the public review of the EA, FTA will consult with SHPO regarding the finding of effect and request concurrence on the finding of no adverse effect to historic resources.

Although there is no constructive use of Section 4(f) resources, Valley Metro has committed to the following measures to minimize harm to Section 4(f) properties:

- Access to Section 4(f) properties would be maintained at all times during construction and operation. In addition, the Build Alternative would enhance access to Section 4(f) resources near the alignment through provision of a convenient and reliable transportation option that provides increased and improved access to transit passengers in the region served by the light rail system.
- During design, Valley Metro would include the installation of low-impact frogs in special trackwork located in proximity to Goemmer House (7246 South Central Avenue), Jefferson Hotel (101 South Central Avenue) and Cate Drugs (1001 South Central Avenue). This would reduce the predicted noise levels to a minimum of 1 dB

above the FTA criteria moderate threshold (see Section 3.8.4.1),⁶ and would reduce the predicted vibration levels below the FTA impact criteria threshold. Additional information about specific FTA noise and vibration thresholds can be found in Section 3.8.1.3.

- During design, Valley Metro would include the installation of a rail boot near Firpo House (1009 South Central Avenue) to reduce the vibration levels below the FTA impact threshold.

Although no damage to historic buildings from adverse vibration levels is anticipated, Valley Metro would perform preconstruction surveys to document the current conditions of the closest buildings (Luhrs Tower, Luhrs Building and Barrister Place) to create a baseline for monitoring potential architectural or structural changes to the properties.

With implementation of the measures to minimize harm, the Build Alternative would have no constructive use of Section 4(f) resources.

3.12 VISUAL AND AESTHETICS

This section summarizes detailed information and analysis regarding visual and aesthetic resources included in Appendix H, *Visual and Aesthetics Technical Memorandum*.

3.12.1 Environmental Setting

3.12.1.1 2015 Conditions

Project impacts on 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 on 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 the Build Alternative would contrast with the landscape or, alternatively, be visually compatible with the landscape.

The existing visual resources and features that can define 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

⁶ Mitigation would not be implemented for exceedances less than 1 dB of the moderate noise impact threshold. A less than 1-dB change in noise level with the Build Alternative is negligible given that 3 dB is considered the threshold at which an average listener can detect a change.

- 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

For the evaluation of the Build Alternative's impacts on visual and aesthetics, the 5-mile study corridor was divided into six visual units, as shown in Figure 3-16. 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, the 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 3-31 summarizes the existing visual setting and land uses within each visual unit.

FIGURE 3-16: VISUAL ASSESSMENT UNITS

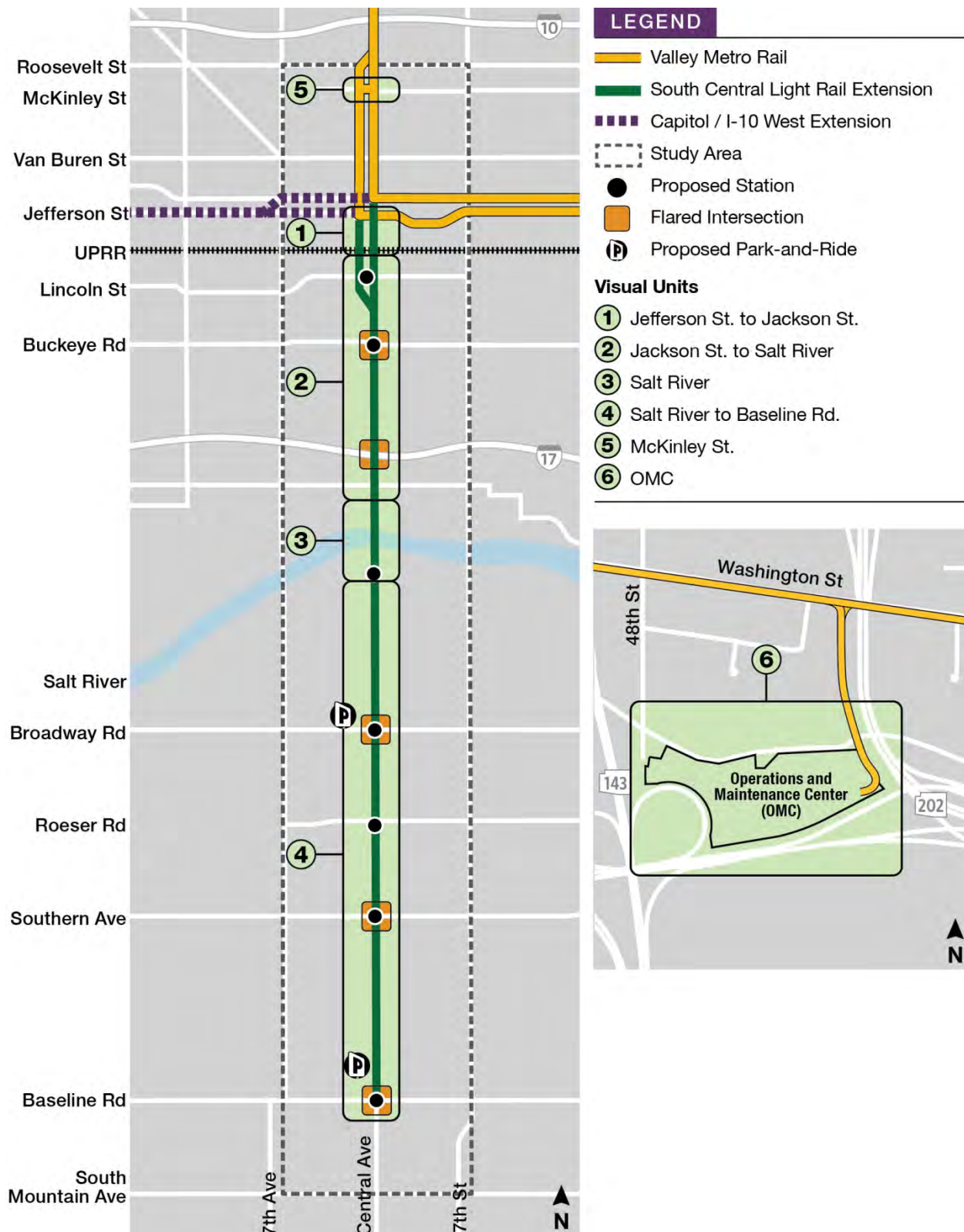


TABLE 3-31: COMPARISON OF CHARACTERISTICS BY VISUAL UNIT

Visual Characteristic	Description
<i>Unit 1 – Jefferson Street to Jackson Street</i>	
Land use	Business commercial
Building height	One to 16 stories
Parking	Some surface parking, parking garages and on-street parking on Central Ave between the UPRR underpass and Hadley St
1st Ave southbound	Three travel lanes, sidewalks both sides, bicycles share travel lanes or use sidewalk
Central Ave northbound	Two travel lanes, sidewalks both sides, bicycles share travel lanes or use sidewalk
Building-to-street relationship	The buildings are predominantly high rises, set close to the street.
Building condition	Overall good. Some buildings are new, others are several decades old.
Vegetation	Some street trees along western side of 1st Ave and the eastern side of Central Ave
Utilities	Standard cobra head street lights on the east sides of streets, copper-colored traffic signal poles, a few power poles along both streets
Viewers	Motorists, pedestrians, bicyclists, transit users
Views	Background—South Mountains to south on 1st Ave, high rises to north on Central Ave; middleground—high rises
<i>Unit 2 – Jackson Street to the Salt River</i>	
Land use	Commercial retail
Building height	Mostly one story
Parking	Surface parking on front, sides or both of buildings
1st Ave southbound	Two travel lanes, turn lanes, bicycle lane, sidewalks both sides
Central Ave northbound	Three travel lanes, turn lanes, bicycle lane, sidewalks both sides
Central Ave Building-to-street relationship	Four travel lanes and a center turn lane, bicycle lanes, sidewalks both sides The buildings are small, some set just behind back of sidewalk, others set back with a few parking spaces in front.
Building condition	Overall good to poor. Some buildings are newer, or are older but well kept; however, many are old and in poor condition, are boarded up or have security fencing and window bars.
Vegetation	The sidewalk is either detached, with plants in the buffer between, or attached with plants behind the sidewalk.
Utilities	Cobra head street lights with power lines between, electrical power lines crossing Central Ave
Viewers	Motorists, pedestrians, bicyclists, transit users
Views	Background—South Mountains to south, Downtown skyline to north; middleground—commercial retail buildings
<i>Unit 3 – Salt River</i>	
Land use	Natural
Building height	One story

Visual Characteristic	Description
Parking	Surface parking
Street	Four travel lanes and a center turn lane, bicycle lanes, sidewalks both sides
Building-to-street relationship	Not applicable
Building condition	Not applicable
Vegetation	Riparian, wetlands
Utilities	Decorative street lights on the bridge; large power lines perpendicular (along northern bank of river)
Viewers	Motorists, pedestrians, bicyclists, transit users
Views	Background—South Mountains and Sierra Estrella to south, Downtown skyline to north; middleground—riparian vegetation
Unit 4 – Salt River to Baseline Road	
Land use	Commercial retail, residences, churches, schools
Building height	Mostly one story
Parking	Surface parking on front, sides or both of buildings
Street	Four travel lanes and a center turn lane, bicycle lanes, sidewalks both sides
Building-to-street relationship	The buildings are small, some set just behind back of sidewalk. Others are set back with a few parking spaces in front.
Building condition	Overall good to poor. Some buildings are newer, or are older but well kept; however, many are old and in poor condition, are boarded up or have security fencing and window bars.
Vegetation	The sidewalk is either detached, with plants in the buffer between, or attached, with plants behind the sidewalk. The raised median has planted areas and grass.
Utilities	Cobra head street lights with power lines between; electrical power lines crossing Central Ave
Viewers	Motorists, pedestrians, bicyclists, transit users
Views	Background—South Mountains to south, Downtown skyline to north; middleground—commercial retail buildings
Unit 5 – McKinley Street Loop	
Land use	Commercial retail, residences
Building height	One and two story
Parking	Surface parking on front, sides or both of buildings
Street	Two travel lanes, sidewalks both sides
Building-to-street relationship	Buildings on the northern side of the tracks are set close to the street; on the southern side of the tracks is a surface parking lot.
Building condition	Good
Vegetation	The sidewalk is detached, with plants in the buffer between
Utilities	Shoebox street lights and light rail transit catenary poles
Viewers	Motorists, pedestrians, bicyclists, transit users
Views	Foreground and middleground—commercial retail buildings
Unit 6 – Operations and Maintenance Center	
Land use	Industrial

Visual Characteristic	Description
Building height	One and two story
Parking	Surface parking
Building-to-street relationship	Buildings are set back from the surrounding freeway ramps by a minimum of 300 feet
Building condition	Good
Vegetation	Native desert surrounding perimeter of site; ornamental plantings at the operations building entrance
Utilities	Numerous light rail catenary poles
Viewers	Operations and Maintenance Center employees and visitors
Views	Background—South Mountains to southwest; middleground—freeway main line and ramps, industrial buildings south of the river and airplane traffic.

3.12.1.2 Methodology

To determine the effects on the visual environment, the study team used a rating system—similar to systems used by the U.S. Forest Service, Bureau of Land Management and FHWA—to depict the Build Alternative’s levels of impact on 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 area’s existing character. 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 3-32.

TABLE 3-32: 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 viewers who live or work in a Build Alternative area versus those who drive or ride transit through the area (Table 3-33).

TABLE 3-33: VIEWER TYPES AND VISUAL IMPACTS SENSITIVITY

Viewer	Definition	Sensitivity to Change
Resident	Residents are the most sensitive viewers. They spend the most time near the Build Alternative elements.	High
Business owners/employees/clientele	People working in or visiting businesses spend typical business hours in the area or make frequent but short buying trips.	Low to moderate
Motorist	Motorists generally travel parallel to the Build Alternative, and their exposure is short term.	Low
Pedestrian/bicyclist	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.	Moderate
Transit user	Bus riders travel to and through the corridor.	Low

Visual quality describes the visual relationship between landscape elements. Each unit was evaluated and assigned an existing visual quality rating (Table 3-34) using the rating categories from Table 3-33.

TABLE 3-34: EXISTING VISUAL QUALITY, BY UNIT

Unit	Vividness ^a	Intactness ^b	Unity ^c	Overall
1 – Jefferson St to Jackson St	Moderate	Moderate	Moderate	Moderate
2 – Jackson St to Salt River	Low	Low	Low	Low
3 – Salt River	Low	Low	Low	Low
4 – Salt River to Baseline Rd	Moderate	Low	Low	Low
5 – McKinley St	Low	Low	Low	Low
6 – Operations and Maintenance Center	Low	Low	Low	Low

^a Vividness is the memorability of landscape components as they combine in striking and distinctive visual patterns.

^b Intactness is the visual order of the natural and built landscape of the immediate environs.

^c Unity is the visual coherence and compositional harmony of the viewshed.

3.12.2 No-Build Alternative

The No-Build Alternative assumes that the light rail and supporting facilities would not be constructed; therefore, no physical alteration of built and natural components would occur in 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, the patterns and trends of land development and socioeconomic activity currently occurring in the corridor would continue, including a continued increase in development and redevelopment actions. Changes would occur through typical market forces and the implementation of various governmental plans for development and redevelopment. The area's general character is expected to remain relatively constant, with some infill occurring. Therefore, the corridor's existing character would not be affected with the decision to implement the No-Build Alternative.

3.12.3 Build Alternative

The Build Alternative is within an existing transportation corridor that contains overhead electrical power lines, traffic signals and, in the southern portion of the alignment, landscaped median, etc. The catenary poles and wires supplying electrical power to the system would occur in the center of the guideway at intervals of approximately 100 to 120 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 on the curb side of the light rail track with the overhead electrical line suspended over the light rail tracks either by span wires or with cantilevered attachments.

The track would be standard gray concrete pavement, approximately 26 feet wide where there is double track, and approximately 13 feet wide for single track. The grey concrete would contrast with the black pavement, not unlike the concrete used for bus bays. The minimum property requirements for each TPSS/signal house site would be approximately 7,000 sq ft., which would accommodate the TPSS/signal house structure, required setbacks and access drives. Where parcels are larger than needed, the remaining site would be landscaped to blend with the surroundings. The TPSSs/signal houses would be custom designed to fit into the character of the surrounding area (for example, constructed of brick, stucco or whatever material/design is appropriate for the setting) and would include landscaping placed around the structure. A TPSS/signal house in any of the locations identified would fit into the context of the surrounding area and would not change the area's character or feel (see Table 2-6 and Section 3.1.3.2). No impact would occur should a TPSS/signal house option be selected in any of these locations. In general, the corridor is absent of scenic vistas, with the predominant land uses being urban and suburban in character; therefore, the light rail facilities are generally visually consistent or compatible with the surrounding existing urban and suburban environment. The OCS and track would be the most visible additions. The track would introduce a new linear element into the roadway but would not disrupt the visual context.

Many power lines are underground in the corridor. However, some exist along and across Central Avenue, but the presence of the electrical wires would be muted given the level of development along the corridor. As a general treatment, the OCS poles would reflect their context.

The Build Alternative would introduce new visual elements, such as light rail stations, trackwork, overhead catenary poles and wires and TPSS structures into the existing visual setting.

Except for the portion of Central Avenue across the Salt River, the corridor is an urban, active area with buildings and parking lots, poles and power lines and other similar features of an urban transportation corridor. The proposed cross section has one traffic lane in each direction and a bicycle lane in each direction. The Build Alternative would add more poles and overhead catenary wires in the median and along the sides of the street. However, no impact would occur because poles and wires already exist along the corridor. The most notable change would be along Central Avenue between the southern bank of the Salt River and Southern Avenue, where a landscaped median would be removed to accommodate the new track construction. The change would be

from tall vertical palms and trees in the median to poles and overhead catenary wires in the median. The change would have a low impact because the introduced vertical elements are similar to existing vertical features.

The Build Alternative would not substantially alter the general urban visual character and thus would have no adverse impact. The Build Alternative and associated facilities would have a low impact on sensitive resources and viewers. In general, the Build Alternative would have no or low impact on the study area. Table 3-35 summarizes the impacts by visual unit. The station locations are in areas of vacant lots and industrial and commercial buildings, so no change to the areas' character or feel would occur.

Two new park-and-ride facilities are part of the Build Alternative. One is at Broadway Road and Central Avenue (west of the Ed Pastor Transit Center on the northwestern corner) and the second is at Fremont Road and Central Avenue (south of Poncho's restaurant on the southwestern corner) near the light rail extension's southern terminus at Baseline Road (see Section 2.2.2.5).

The park-and-ride facility adjacent to and west of the Pastor Transit Center would be on an approximately 1 acre undeveloped site and would accommodate 70 to 80 vehicles. The land west and north of the parcel is vacant. Across the street to the south are an auto repair shop and two residences. The new park-and-ride facility would look like an extension of the transit center parking lot and would not change the character or feel of the area.

The location at Fremont Road and Central Avenue is currently vacant. The T-shaped parcel is adjacent to a restaurant to the north, industrial buildings to the west and offices to the south and across the street to the east. The parcel is approximately 3 acres and would accommodate approximately 365 vehicles. A new parking lot would not change the character or feel of the area.

McKinley Street between Central and 1st Avenues contains a loop allowing for light rail vehicles to turn around and to achieve other operation flexibility during special events. The Build Alternative would construct an additional loop to provide increased operational flexibility. The addition of the loop would not change the area's character or feel.

The OMC is an existing light rail train yard with two main buildings where vehicles are maintained and which also contain the operations control center and offices, TPSSs, train tracks and many power poles and overhead wires. The addition of a few more tracks and the expansion of an existing warehouse building to accommodate more trains would not change the area's character or feel.

The traffic mitigation improvements on 7th Street and 7th Avenue occur within an existing transportation corridor. The improvements would visually be same as the 2015 condition; therefore, no adverse impacts would occur.

TABLE 3-35: IMPACTS, BY VISUAL UNIT

Unit ^a	Impact ^b
1 – Jefferson St to Jackson St	No adverse impacts
2 – Jackson St to Salt River	No adverse impacts
3 – Salt River	No adverse impacts
4 – Salt River to Baseline Rd	Low impact: The most notable change would be along Central Ave between the southern bank of the Salt River and Southern Ave where a landscaped median would be removed to accommodate the new track construction. The change would be from tall vertical palms and trees in the median to poles and overhead catenary wires in the median. The change would be a low impact because the introduced vertical elements are similar to existing vertical features.
5 – McKinley St	No adverse impacts
6 – Operations and Maintenance Center	No adverse impacts

^a Locations of visual units are presented in Figure 3-16.

^b Impacts are reported without mitigation. The mitigation measures specified in Section 3.12.4 would reduce impacts to less than adverse.

The changes to the urban setting brought about by the Build Alternative would be consistent with the existing urban setting and so would not adversely affect the visual setting of the National Register-listed and eligible historic districts, buildings and structures adjacent to the alignment, as discussed in Section 3.10.

3.12.4 Mitigation

No mitigation is necessary for the track alignment, McKinley Street tracks, stations, OMC, TPSSs or park-and-ride facilities. The Build Alternative is not expected to contribute to adverse visual effects or cumulative adverse impacts.

Although no mitigation is necessary since the Build Alternative would not result in visual and aesthetic impacts, the Build Alternative's final design would incorporate specific aesthetic guidelines for stations, platforms, TPSSs, overhead catenary poles and wires and track where possible. The Build Alternative would conform to guidance and specifications in the *Urban Design Guidelines* (2001), *METRO Central Mesa LRT Extension Urban Design Guidelines* (2010) and Valley Metro's applicable design criteria for stations, landscape, etc. These documents include methods to enhance and maintain urban continuity and to blend the Build Alternative's features into the existing setting.

Methods that could be adopted are:

- Integrating new facilities with area redevelopment plans.
- Minimizing the height of facilities to the extent possible to reduce their visibility.
- Using light fixtures that would not cause light spillover into residential areas.
- Carefully selecting TPSS sites and customizing them using building materials and architectural styles that are compatible with the surrounding environment.
- Providing new landscape to create continuity throughout the Build Alternative area.

- Connecting the stations to surrounding neighborhoods with sidewalks and paths within a one-quarter-mile radius of each station.

3.13 COMMUNITY IMPACTS

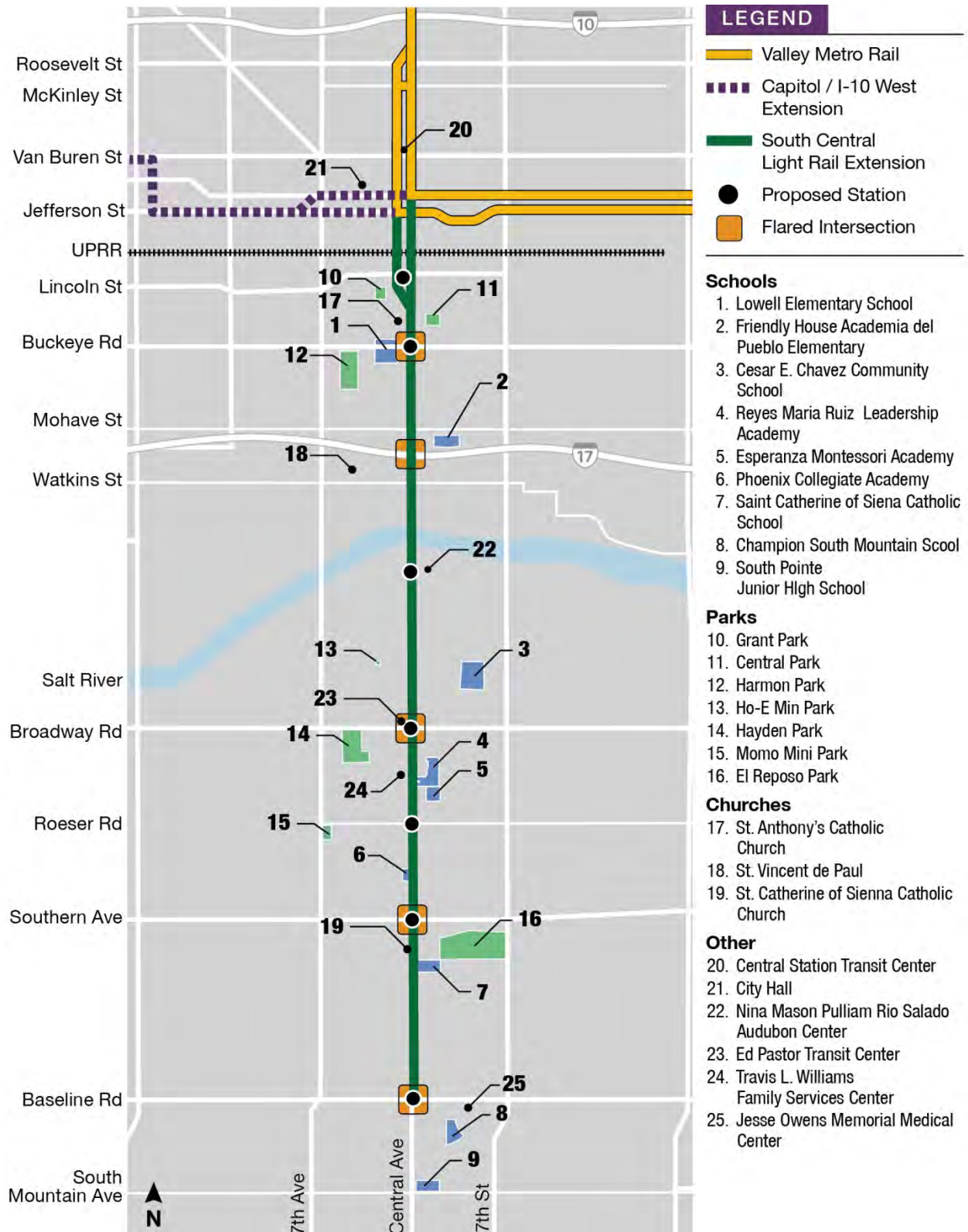
3.13.1 Environmental Setting

As discussed in Section 3.2, the Build Alternative corridor is highly urbanized with land uses that vary from dense public and employment uses to single-family residential districts. Land uses immediately south of Downtown Phoenix adjacent to the Build Alternative corridor are primarily urban, including light industrial, public uses and transportation (parking lots). As the Build Alternative extends south, single-family housing becomes more prominent until the Salt River. South of the Salt River, existing land uses are almost exclusively light industrial, with small amounts of commercial use immediately adjacent to Central Avenue. Residential land uses are more predominant in the southernmost portion of the study area.

Numerous community facilities and services are in the immediate vicinity of the study area, consisting of schools, parks, sidewalks and bicycle lanes, transit services and emergency services. Representative facilities and services in the vicinity of the study area are listed below and depicted in Figure 3-17:

- **Schools:** Several schools are in the vicinity of the study area, including Lowell Elementary School, Friendly House Academia del Pueblo Elementary, Cesar E. Chavez Community School, Reyes Maria Ruiz Leadership Academy, Esperanza Montessori Academy, St. Catherine of Siena Catholic School, South Pointe Junior High School, Champion South Mountain School and Phoenix Collegiate Academy.
- **Parks:** A number of parks provide a large amount of open space in the study area, including Grant Park, Central Park, Harmon Park, Hayden Park, El Reposo Park, Ho-E Min Park and Momo Mini Park.
- **Churches:** Several churches are within the study area, including St. Anthony Catholic Church, the Church at South Mountain, Southside Church of Christ, the Church of Jesus Christ of Latter Day Saints, Victory Assembly Church, St. Catherine of Siena Roman Catholic Church and the Southern Baptist Temple.
- **Sidewalks and bicycle lanes:** The City of Phoenix has a well-developed network of bicycle facilities and sidewalks throughout most of the study area. Sidewalks are present along all arterial roadways and most neighborhood connector streets throughout the study area. The Phoenix Sonoran bikeway, one of the City's key bicycle routes, extends south from Downtown along Central Avenue. Additionally, bike lanes are present along portions of 7th Avenue, 7th Street, Mohave Street, Roeser Road and Southern Avenue. For additional information on bicycle and pedestrian facilities, see Section 3.6.3.3.
- **Transit service:** The study area is served by a network of fixed-route buses, LRT and the Ed Pastor Transit Center (see Table 2-5 in Chapter 2.0).

FIGURE 3-17: COMMUNITY FACILITIES IN THE STUDY AREA



- Emergency services: The Jesse Owens Memorial Medical Center, the City of Phoenix Fire Department Station 22 and the City of Phoenix Police Department are within the study area.
- Other: Additional facilities include the Rio Salado Audubon Center, St. Vincent de Paul, Travis L. Williams Family Services Center, Harmon and Ocotillo Branch Libraries and various cultural and recreational venues including Talking Stick Resort Arena, Chase Field, Arizona Science Center and Phoenix Convention Center.

3.13.2 No-Build Alternative

The No-Build Alternative represents conditions in 2035 if the South Central Light Rail Extension is not built and is defined as the existing transit and roadway/highway system plus programmed (committed) transportation improvement projects, as discussed in Section 2.2.1.

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 disrupt the following community characteristics:

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

Quality of life, however, could be potentially reduced by decreased community mobility if existing transportation facilities do not keep up with demand. The community would not benefit from the enhanced 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 primarily located within existing City of Phoenix public street ROWs and would require mostly partial land acquisitions for the alignment, TPSS sites, signal houses, light rail stations, existing curb modifications and park-and-ride lots. The full acquisitions would not affect any community facilities. The partial acquisitions also would have no effect on community facilities since neither the facilities nor the services they provide would be affected. The proposed park-and-ride lots would not adversely affect community facilities, mobility or cohesion. They would be beneficial to the community by providing local access to the light rail stations and thereby reducing auto VMT on roadways in the Build Alternative area. They would also offer auto drivers and their passengers an option to park and instead take a convenient one-seat transit ride to major employment centers, activity centers and other destinations.

The Build Alternative would cause no permanent barriers to the movement of people, goods and services in the area and no permanent disruption of the community. Furthermore, access to community services and facilities would be maintained during construction. Therefore, no continuity or community cohesion concerns are anticipated as a result of the Build Alternative. For additional information on temporary disruptions that may occur during construction, see Section 3.20.

Positive effects from the Build Alternative would include increased mobility, enhanced access to local and regional destinations and businesses, job growth stimulation and a reduction in overall VMT on roadways proximate to the Build Alternative area.

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 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.
- Providing 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

FTA Circular 4703.1 defines a “minority person” as someone 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 set 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) consisted of the following steps:

- Define the unit of geographic analysis affected by the 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 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 benefits of the Build Alternative.
- Determine disproportionately high adverse impacts (if any).

The study area identified for this analysis is within approximately one-half mile of the Build Alternative alignment and other facilities associated with the light rail extension. Maricopa County has been selected as the unit of geographic analysis for comparison to the study area level in accordance with 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. 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 were based on 2009 to 2013 American Community Survey 5-year estimates and were aggregated at the CT level because this was the smallest geographic level at which data for both groups were available. Ten CTs fall within the study area and are evaluated in greater detail below.

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

- Is predominantly borne by a minority population 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 nonminority population and/or non-low-income population.

Identifying whether a project will have disproportionately high and adverse environmental effects on minority and low-income populations, and avoiding such effects, 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 affected; (3) evaluating the alternatives considered and (4) considering the public involvement process. 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.

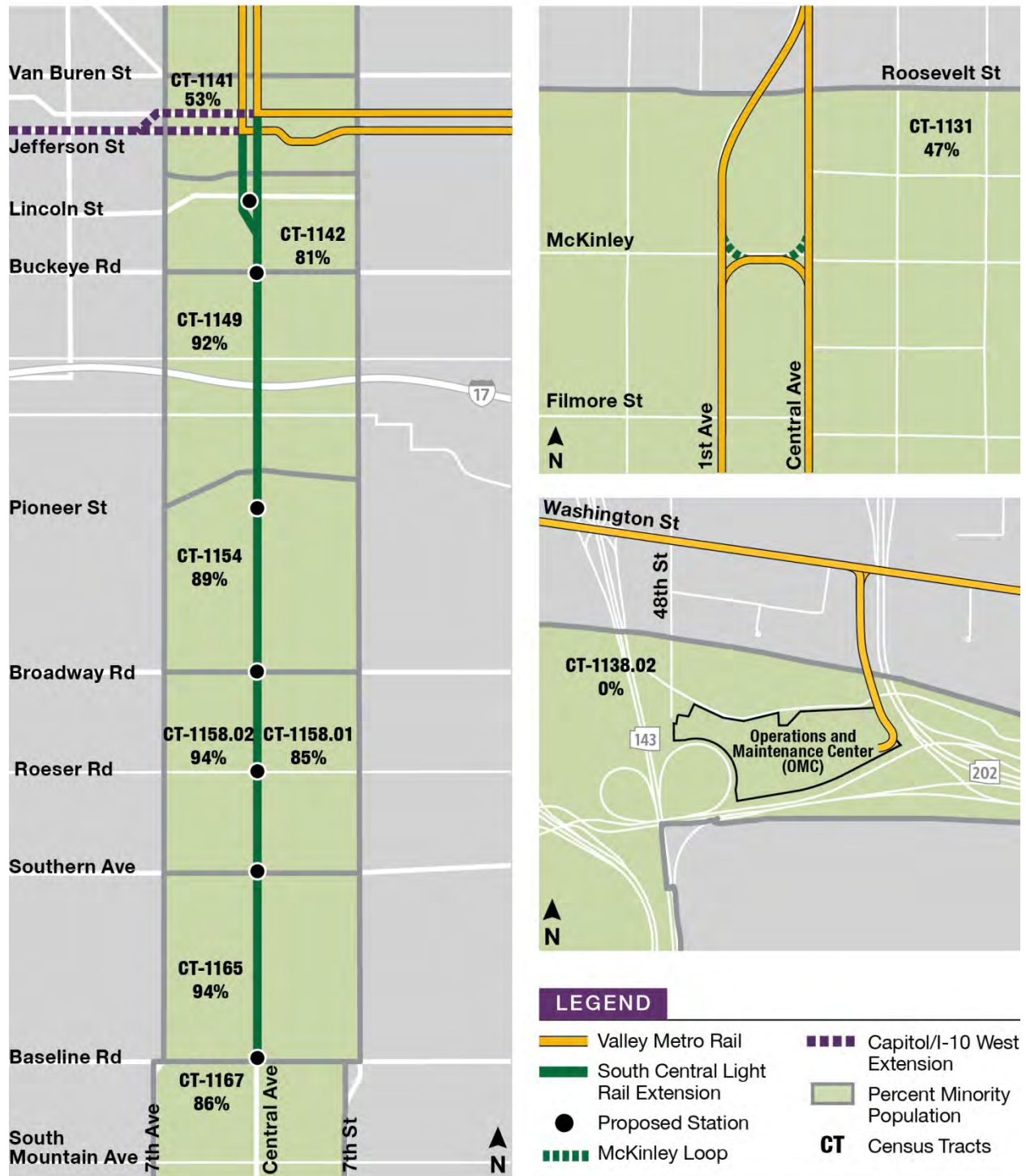
Environmental justice areas were identified as those CTs where the concentration of environmental justice populations exceeded regional averages or was greater than 50 percent of the total population.

3.14.1.3 Locations of High Concentrations of Minority and Low-Income

The Build Alternative study area features a 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 (Figures 3-18 and 3-19). Nine of the 10 CTs in the study area feature concentrations of minority populations that exceed the 42 percent average for Maricopa County. The tenth CT (near the OMC) has no population residing within it. The percentage minority population in the study area CTs (with the exception of the one near the OMC) ranges from 47 to 92 percent, with 8 of 10 CTs above 50 percent (Figure 3-18 and Table 3-36).

Similarly, 9 of 10 of the study area CTs contain concentrations of low-income populations that exceed the 26 percent average for Maricopa County, with the tenth CT containing no residents. The percentage 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 43 to 87 percent (Figure 3-19 and Table 3-36). No efforts were made 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 have 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.

**FIGURE 3-18: STUDY AREA PERCENTAGE
MINORITY POPULATION COMPARISON**



**FIGURE 3-19: STUDY AREA PERCENTAGE
LOW-INCOME POPULATION COMPARISON**

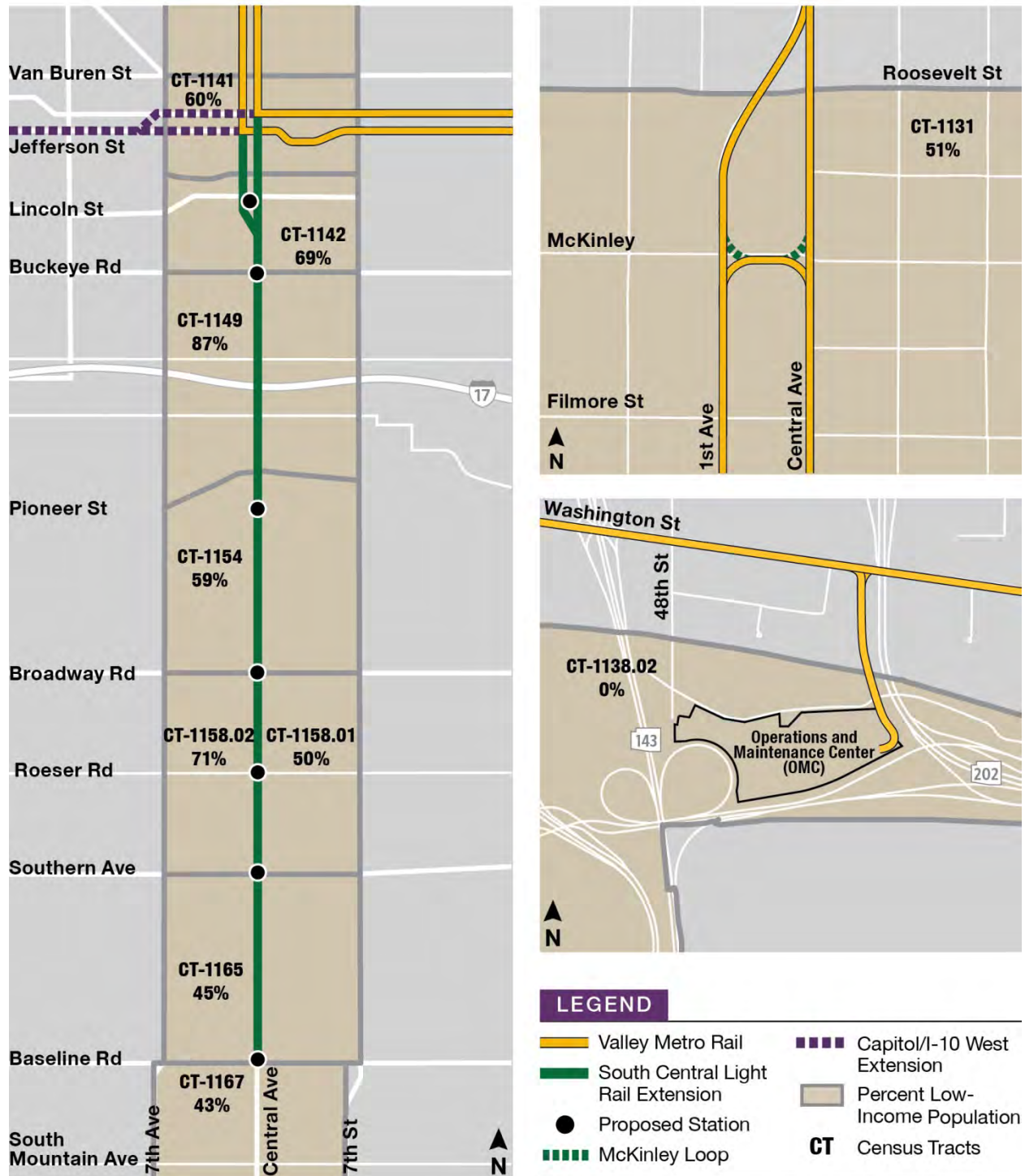


Table 3-36 summarizes the evaluation results for minority and low-income populations in the Build Alternative study area.

TABLE 3-36: MINORITY AND LOW-INCOME POPULATIONS

Census Tract/ Area	Minority			Low-income		
	Minority Population	Total Population	Percentage Minority Population	Low-income Population ^a	Total Population for Which Low-income Status is Defined ^b	Percentage Low-income Population ^a
1131	1,155	2,478	47	1,267	2,478	51
1141	990	1,851	53	1,110	1,851	60
1142	1,192	1,465	81	1,011	1,465	69
1149	2,500	2,706	92	2,361	2,706	87
1154	2,126	2,402	89	1,416	2,402	59
1158.01	3,588	4,225	85	2,102	4,225	50
1158.02	3,147	3,363	94	2,414	3,363	71
1165	4,674	4,988	94	2,221	4,988	45
1167	6,285	7,322	86	3,136	7,322	43
1138.02 ^c	0	0	0	0	0	0
Maricopa County	1,624,496	3,889,161	42	1,003,145	3,839,007	26

Source: American Community Survey (2013)

^a 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.

^b 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.

^c There is no residential population in Census Tract 1138.02, which is near the Operations and Maintenance Center.

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, no construction-related impacts would occur in environmental justice areas. The No-Build Alternative could result in an adverse impact on 20 intersections in the study area through degradation in the LOS and increased delay. The No-Build Alternative would not substantially increase transit service in the study area, and thus would not improve the mobility of the low-income and minority populations in the Build Alternative corridor. It would maintain the status quo with existing transit service levels and not provide enhanced access to employment and destinations through the regional high-capacity transit systems. The No-Build Alternative would also not promote higher density development or transit-oriented development in the corridor.

3.14.2.2 Build Alternative

Implementation of the Build Alternative is anticipated to have several positive impacts for the City of Phoenix and the greater region. 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 ROW acquisition for guideway, stations, park-and-rides, roadway widening and traffic mitigation of 126 parcels (approximately 330,434 sq ft.). Of the 126 parcels, 121 would be partial acquisitions and 5 would be full acquisitions. Unlike full acquisitions, partial acquisitions would allow the property owners to maintain ownership and use of their property after acquisition. The Build Alternative would also require the acquisition of five to six parcels (approximately 35,911 sq ft.) for the construction of TPSSs and signal houses. Of these parcels, one would require a full acquisition and business relocation, while the remaining parcels would be partial acquisitions (see Section 3.1 for more information regarding land acquisitions). The Build Alternative would not result in the displacement of residential properties. For the displacement of the two businesses, the impact would be mitigated through the provisions established under the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894) (see Section 3.1 for more information). With respect to displacements and relocations, the Build Alternative would not result in a disproportionately high and adverse environmental impact on environmental justice populations.

Transportation

The Build Alternative is not anticipated to have an adverse effect on traffic along Central Avenue. The LOS at every intersection would be maintained or improved as a result of reducing the number of travel lanes on Central Avenue. The reduction of travel lanes on Central Avenue would cause some traffic to divert to 7th Street and 7th Avenue, resulting in degraded LOS at five intersections on those roadways (see Section 3.6 for more information). The potential impacts on LOS at these intersections would be mitigated by the City of Phoenix and Valley Metro; therefore, the Build Alternative would not result in an adverse effect at these intersections.

One loading zone on the east side of 1st Avenue between Jefferson and Madison Streets would be displaced as a result of the Build Alternative. This loading zone would be replaced by converting one of the proposed parking spaces on the western side of Central Avenue between Madison and Jefferson Streets. The removal of the parking space would be negligible because off-street parking is provided on the northeastern corner of Madison and Jefferson Streets.

The Build Alternative would remove three on-street parking spaces on the eastern side of 1st Avenue and two parking spaces on the western side of Central Avenue between Jefferson and Madison Streets. The loss of these five spaces would be offset by the addition of 16 new parking spaces on Jackson Street as well as the ample off-street parking on side streets and parking garages such as the facility on the northeastern corner of 1st Avenue and Madison Street. Approximately 80 off-street parking spaces

are anticipated to be removed at seven separate locations along the alignment. Central Avenue along the entire length of the Build Alternative contains ample off-street parking to negate the loss of these 80 spaces.

The displaced loading zone on the eastern side of 1st Avenue between Jefferson and Madison Streets would be replaced by converting a proposed parking space on the western side of Central Avenue between Madison and Jefferson Streets. The removal of the one parking space would be negligible because off-street parking is provided on the northeastern corner of Madison and Jefferson Streets.

There would be no adverse effect on sidewalks or the pedestrian environment, existing or planned bicycle facilities or freight railroads and truck routes. Valley Metro has adopted design standards that are incorporated on every new HCT project to improve and enhance pedestrian and bicycle movement, facilities and access. This generally includes the reconstruction of sidewalks to at least 6 feet in width, the addition of a landscaped buffer, bicycle lanes and crosswalks at all intersections. Bicycle lanes would be added where they are currently missing, so that a continuous bicycle lane would run on each side of Central Avenue from Downtown Phoenix to Baseline Road. Bicycle boxes and shared bicycle lanes would be added to specific parts of the corridor to improve bicycle safety and traffic flows. New signs and signals would be added at intersections where necessary.

The Build Alternative would enhance transit operations and connections throughout the area. Additionally, operational efficiencies would be implemented to reduce duplicative transit services (see Section 3.6).

The proposed bus service adjustments, which are intended to either enhance connections to the proposed light rail service or eliminate duplication of services, are intended to be implemented at the same time as the introduction of light rail service in the corridor. As a result, the proposed bus service adjustments would not disrupt or otherwise cause public services to be unavailable.

Combined with other existing transit services, the proposed bus service adjustments offer the population served by the Build Alternative, including minority and low-income persons, transit service availability equal to or greater than what is currently available in the corridor. A comparison of service availability between the No-Build and Build Alternatives for each of the proposed bus service adjustments is provided below:

- Route 0 (Central Avenue) – Between Baseline Road and Central Station (Central Avenue/Van Buren Street) this route would be duplicated by the proposed Build Alternative transit service. The proposed bus service adjustment would reduce the frequency from 10 minutes/20 minutes (peak/off-peak) to 20 minutes/30 minutes (peak/off-peak), matching the existing frequency of the segment of Route 0 north of Central Station. Despite reducing the frequency of Route 0, the total number of trips offered each hour, in each direction, would increase with the introduction of light rail service. Route 0 is being maintained in the corridor to offer access to the regional transit network for people who may desire to start or end their trip at a location between light rail stations.
- Route 77B (Baseline Road) – Combined with existing Route 77 (Baseline Road), this route will increase frequency between the existing 27th Avenue/Baseline Road and

24th Street/Western Canal park-and-ride facilities. The proposed bus service adjustments would provide an improved level of service along the designated segment of Baseline Road and would increase the number of transfer opportunities to other connecting transit services including the proposed South Central light rail service.

- Central South Mountain East and West RAPID Routes – Currently, the Central South Mountain East and West RAPID service provides a limited number of peak period/peak-direction trips. With the introduction of light rail service on Central Avenue, the proposed addition of Route 77B on Baseline Road and existing local and express bus service on Washington and Jefferson Streets in Downtown Phoenix, Central South Mountain East and West RAPID passengers would not only maintain access to the Downtown Phoenix and State Capitol areas, but would have access to higher frequency services on Baseline Road and Central Avenue with the proposed Build Alternative bus and light rail service adjustments. However, the elimination of the Central South Mountain East and West RAPID routes may require some existing passengers to transfer depending on their trip origin and/or destination.

Each of the proposed service adjustments reduce or eliminate duplicative service and/or enhance the level of service provided to the public. The proposed bus service adjustments do not result in the denial of, reduction in or substantial delay in the receipt of benefits by minority and low-income populations as the bus service adjustments are offset by the proposed transit service enhancements to a greater number of minority and low-income persons.

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

Noise and Vibration

The Build Alternative would result in moderate noise impacts at two residences and severe noise impacts at an additional two residences along the Build Alternative alignment. The moderate noise impacts would occur as a result the proximity of the residences to special trackwork. The severe noise impacts would occur as a result of the proximity of the residences to special trackwork and a potential TPSS site. While six potential TPSS sites have been proposed for environmental clearance, only five would be needed for the Build Alternative. Final TPSS locations would be determined in the more refined design stages of the Build Alternative when the energy loading requirements can be determined. Section 3.8.3 provides additional information about the impacts and locations of the affected sensitive uses relative to the Build Alternative alignment.

Potential vibration impacts are also likely to occur at 11 different locations, including two multifamily residential buildings, along the Build Alternative alignment. Section 3.8.3 provides additional information about the impacts and locations of the affected sensitive uses relative to the Build Alternative alignment.

Mitigation measures have been identified in Section 3.8.4 to reduce all noise and vibration impacts to below FTA's moderate threshold criteria. Therefore, with respect to noise and vibration, the Build Alternative would not result in a disproportionately high and adverse environmental impact on 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 community characteristics listed above because the Build Alternative would be located almost entirely within existing public street ROW, with the exception of land acquisitions at major intersections, station locations, TPSS sites, signal houses and sites of modifications to 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 no continuity or community cohesion concerns would result from the Build Alternative. The Build Alternative would not acquire any land from community facilities or parks. The Build Alternative is designed to enhance access to community destinations, facilities and services, and would not create any physical barriers that restrict access or divide the surrounding community. 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 on environmental justice populations.

For further information on temporary disruptions that may occur during construction, refer to Section 3.20.

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 3-48 in Section 3.20. Additional mitigation measures related to construction are also presented in Section 3.20. With respect to construction, impacts would be temporary and would last the period of construction for the entire length of the Build Alternative. The project would result in short-term disruption impacts on local businesses and residents surrounding construction. Short-term impacts are 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 would be implemented. As with any construction project, the adverse impacts would end upon construction completion. Any impacts would be borne equally by all populations benefitting from the Build Alternative, 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 Build Alternative would provide improved transit access to South Phoenix and Downtown Phoenix. In addition, the Build Alternative would provide more convenient

and reliable transit access to regional destinations through its connection with the existing Valley Metro light rail system that now serves portions of west Mesa, Tempe and Phoenix. This reliable transit service would improve the mobility of the low-income and minority populations in the Build Alternative corridor. The Valley Metro light rail line also serves many major regional employment centers, higher education institutions, health care services and other significant regional activity centers. With a high volume of regular pedestrian traffic and linkages to regional transit networks, the Build Alternative would capitalize on the rapid urban development currently occurring in Downtown Phoenix, foster future growth and urban intensification in South Phoenix and greatly improve urban circulation throughout the city.

The Build Alternative is anticipated to have positive effects on both commercial and residential development, including high-density affordable housing, near its alignment and stations. As a result, some of the growth that would have occurred elsewhere in the city or the region would be drawn to the Build Alternative corridors. This growth can 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 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.

All public meetings were widely publicized through:

- Individual outreach to key business stakeholders, residents, government officials and other stakeholders
- Group outreach to community groups, government agencies, chambers of commerce, churches, schools and neighborhood/homeowner groups
- Media outreach through press releases and paid advertisements in local print media, including the *Arizona Republic* and the Spanish-language publication *La Voz*
- Information posted on the City of Phoenix and Valley Metro websites, with Build Alternative and public meeting details
- Bilingual door hanger meeting notices distributed to stakeholders within a quarter-mile of the study area

Throughout the AA and environmental analysis, Valley Metro has conducted numerous public outreach efforts, including hosting general public meetings; coordinating staff and agency meetings; presenting at Board, Committee and City Council meetings; attending stakeholder meetings and coordinating the CWG. All of the meetings provided opportunities for minority and low-income populations to take part in the decision-making process. For more information on specific meetings and topics, refer to Chapter 4.0 of the EA.

As the 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.

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

As discussed in Section 3.14.1.3, minority and low-income residents are present throughout the one-half mile area around the Build Alternative. The impacts evaluation and mitigation measures for adverse impacts presented in Section 3.14.2 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 benefitting from the proposed project, 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 fact that the benefits and the burdens of the Build Alternative are balanced across all demographic groups affected by the proposed project and that mitigation measures have been identified to minimize adverse impacts, the Build Alternative would provide considerable benefits and has garnered considerable local support. Therefore, there would be no disproportionately high and adverse impacts on low-income or minority populations.

3.15 HAZARDOUS MATERIALS

For additional information regarding potential hazardous materials impacts along the South Central Avenue corridor, refer to Appendix J, *Phase I Environmental Site Assessment*.

3.15.1 Environmental Setting

The Build Alternative area is in an urban area with a mixed land uses, including residential, industrial, commercial and public land. Within these broad categories, numerous auto repair facilities, current and former service stations, shopping centers and manufacturing facilities are present. Land use in the northern section is consistent with an urban (Downtown) area. In the middle section, land use is consistent with an industrial and commercial area. The southern portion's land use is consistent with a residential area. Many of the buildings along the Build Alternative corridor date to the 1960s, along with several redeveloped areas. Existing development along Central Avenue consists of both occupied and vacant properties.

Clusters of historic gas stations/auto repair shops and dry cleaners are present throughout the Build Alternative area, along with scattered individual sites. Two such clusters are Central Avenue/Jefferson Street and Central Avenue/West Road. Every major intersection in the Build Alternative area historically had at least one gas station/auto repair shop present at some point in time.

The Motorola 52nd Street Superfund Site (a chlorinated solvent-impacted groundwater plume) extends beneath the Build Alternative area near the northern end of the corridor.

Groundwater depth averages approximately 275 feet below ground surface within the study area (Arizona Department of Water Resources [ADWR] 2015a). The Build Alternative area crosses the Salt River, suggesting that groundwater flow would be to the west and gradually toward the Salt River.

A computerized environmental information database search was performed for the Build Alternative area by EDR on July 22, 2015. EDR's report (2015) identified 363 listings within a one-half mile buffer zone that were relevant to the Build Alternative area. However, based on the location of a listed site, current status of the listing and/or nature of the database, 49 potential sites of concern were identified. Most of the listings correspond to underground storage tank (UST) or leaking underground storage tank (LUST) cases. It is important to note that hazardous materials contamination can exist in the soil surrounding a UST site not otherwise classified as a LUST site, and that residual contamination in soil surrounding a closed LUST case often occurs.

Other hazardous materials listings in the Build Alternative area include former service stations, dry cleaners, other generators of hazardous wastes and areas of known releases of hazardous materials. For additional information refer to Appendix J, *Phase I Environmental Site Assessment*.

Based on the types of sites that occur in the Build Alternative area, the most likely kinds of contaminants that could be encountered during construction are hydrocarbons such as gasoline and petroleum compounds, heavy metals and dry cleaning solvents.

Hydrocarbons include a broad range of petroleum-based compounds that are either refined petroleum products or degraded byproducts derived from a release of petroleum products into the soil and groundwater. Many of these compounds are carcinogenic, notably come chemical components of gasoline and diesel fuel. In addition to cancer, hydrocarbons can cause respiratory distress/failure and kidney, nervous system and brain damage. Additional trace components of gasoline such as ethylene dibromide are also part of a typical UST release.

Heavy metals are often present in actionable concentrations, either from naturally occurring sources or as components of the release of other chemicals. Many of these heavy metals are toxic to humans. One example is lead, which was a component of gasoline from the 1930s through the 1980s. Lead, released along with gasoline, is long-lived and persistent in the subsurface (does not chemically break down like hydrocarbons), and is a neurodepressant, particularly dangerous to developing children and persons with compromised autoimmune systems. Another example is arsenic, which is naturally occurring at fairly high concentrations in Arizona. Arsenic was (and is) a component of many commercial pesticides for decades and, like lead, does not break down in the environment. Cadmium (a component of structural steel), zinc (a common rust preventative in paints) and chromium (a common paint pigment and steel hardening agent) may also occur in urbanized areas, and are all toxic to humans above certain concentrations. These metals are just a few of the regulated heavy metals common in Arizona soils.

Dry cleaning solvents, including the most common perchloroethylene (commonly known as "perc"), are toxic to humans. Dry cleaning solvents that are no longer used, but were

common in years past, include kerosene and carbon tetrachloride, as well as several other exotic chlorinated solvents. These solvents are considered a toxic air pollutant by EPA, meaning that they are “known or suspected to cause cancer or other serious health effects.” Short, intense blasts of perc can cause dizziness, headaches or loss of consciousness. Each of these compounds is persistent in the subsurface environment when released, often remaining in soil and groundwater for decades.

Hazardous materials sites of concern are located throughout the study area. Tables 3-37 to 3-40 and Figures 3-20 to 3-23 show the sites of concern rated as high, moderate, low and indeterminate risk. These risks are related to the potential for hazardous materials to be encountered during construction, which in turn relates to potential for human exposure to those contaminants

High-risk Sites

Twenty-one high-risk sites were identified along the Build Alternative corridor. High-risk sites are those with a high potential for releasing hazardous materials to soil or groundwater, or are sites that have a recorded release. Examples of high-risk sites identified in the database search include facilities with USTs or LUSTs, current and historic service stations and dry cleaners, hazardous waste generator facilities on potential acquisition properties or properties identified as having a known release of hazardous materials.

Moderate-risk Sites

Moderate-risk sites have a moderate potential for releasing hazardous materials to soil or groundwater. Examples of moderate-risk sites include facilities adjacent to the Build Alternative corridor with registered USTs, but no LUST or closed LUST cases. Facilities adjacent to the Build Alternative listed as generators of hazardous wastes are also considered to be moderate-risk. Nineteen moderate-risk sites were identified.

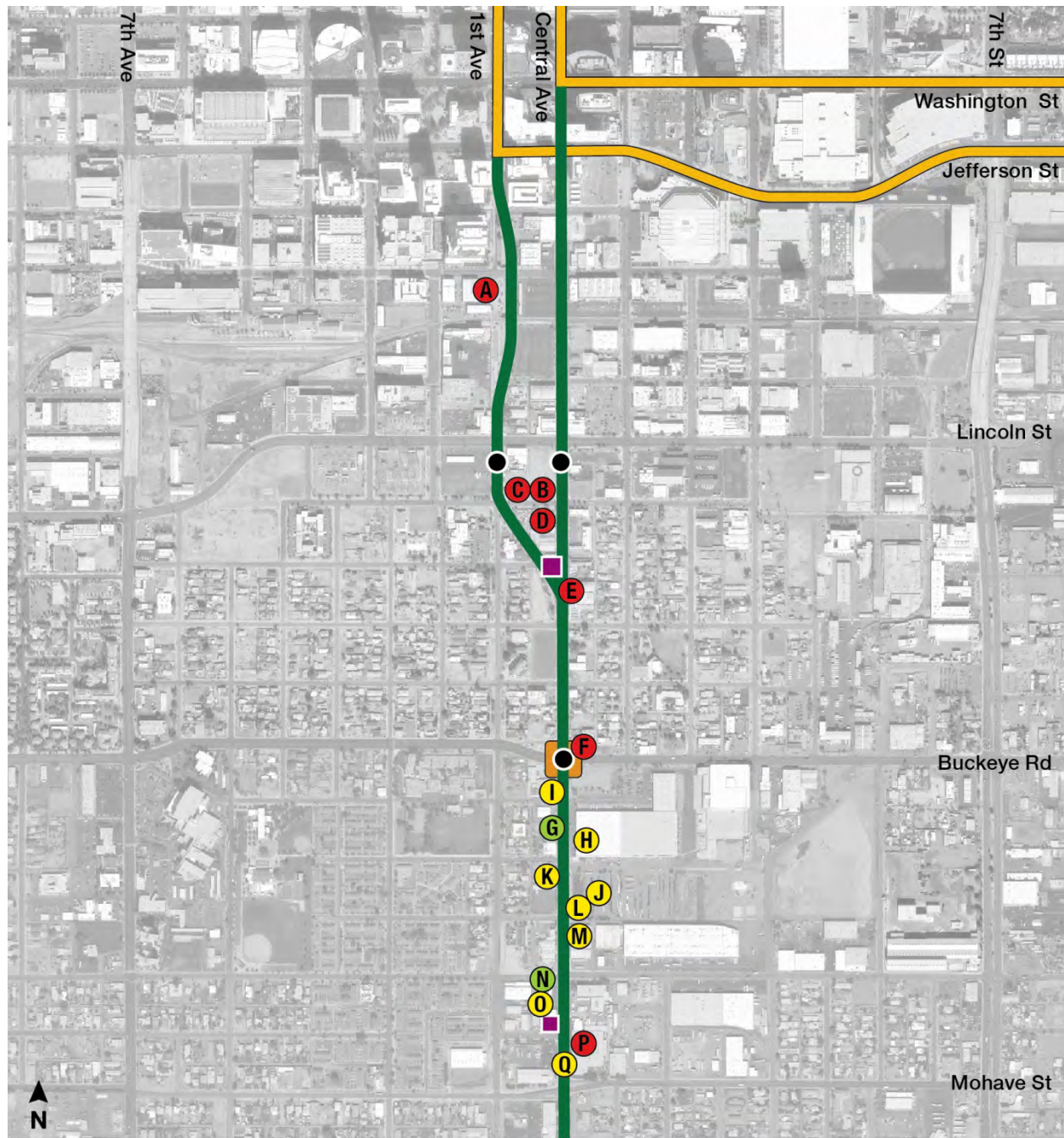
Low-risk Sites

Low-risk sites are those having few indications of potential for release of hazardous materials to soil or groundwater. Seven low-risk sites were identified along the Build Alternative corridor.

Indeterminate-risk Sites

Indeterminate-risk sites are those which, at the time of report preparation, did not include sufficient information to designate a high, moderate or low risk ranking. Indeterminate-risk sites often require additional file review to determine the details of any related environmental issues. Two sites of indeterminate risk were identified along the Build Alternative corridor.

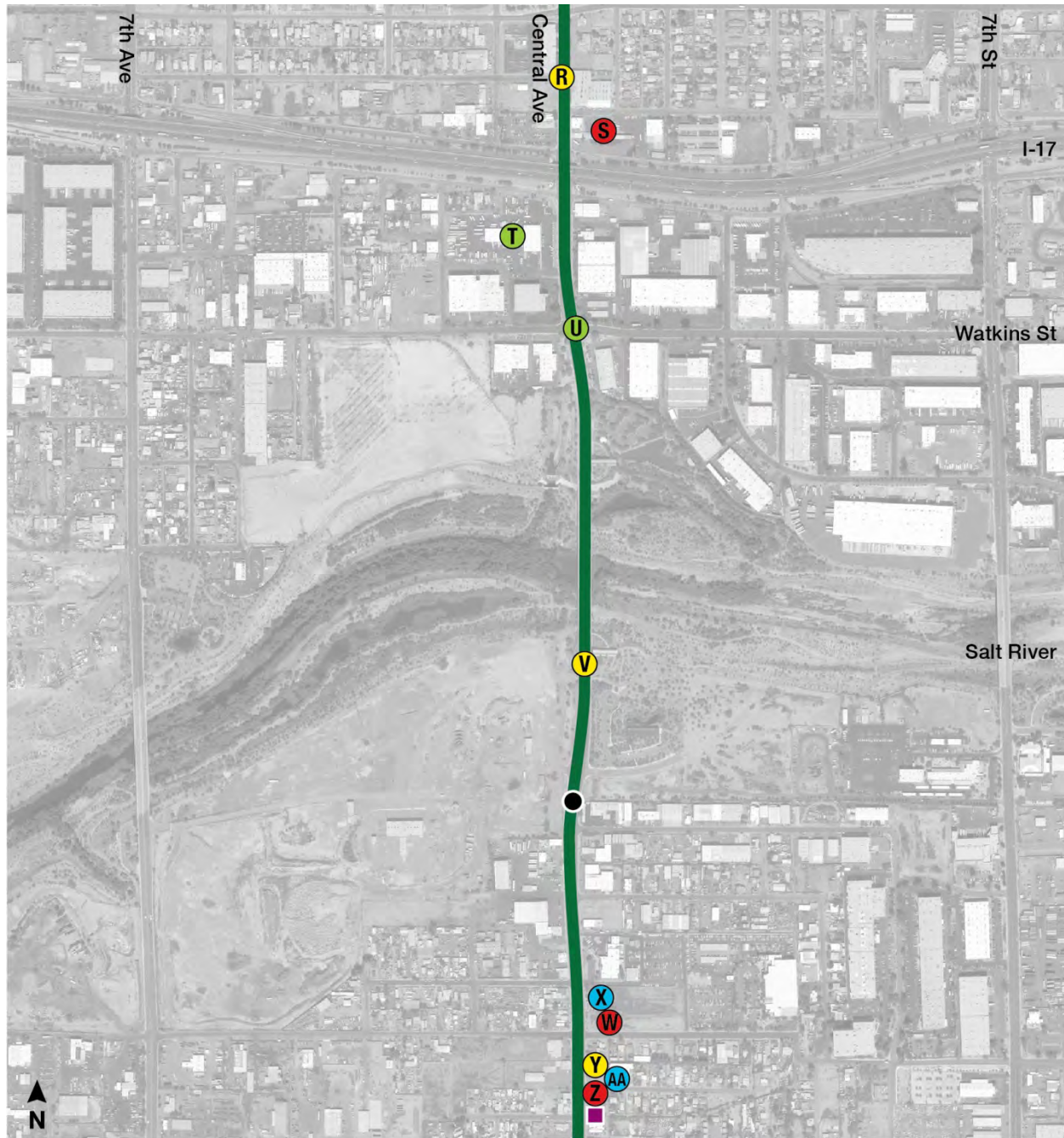
**FIGURE 3-20: POTENTIAL SITES OF CONCERN,
WASHINGTON STREET TO MOHAVE STREET**



LEGEND

 Valley Metro Rail	 Flared Intersection	Risk Level
 South Central Light Rail Extension	 Potential Park-and-Ride	
 Proposed Station	 Potential TPSS	 High
		 Moderate
		 Low
		 Indeterminate

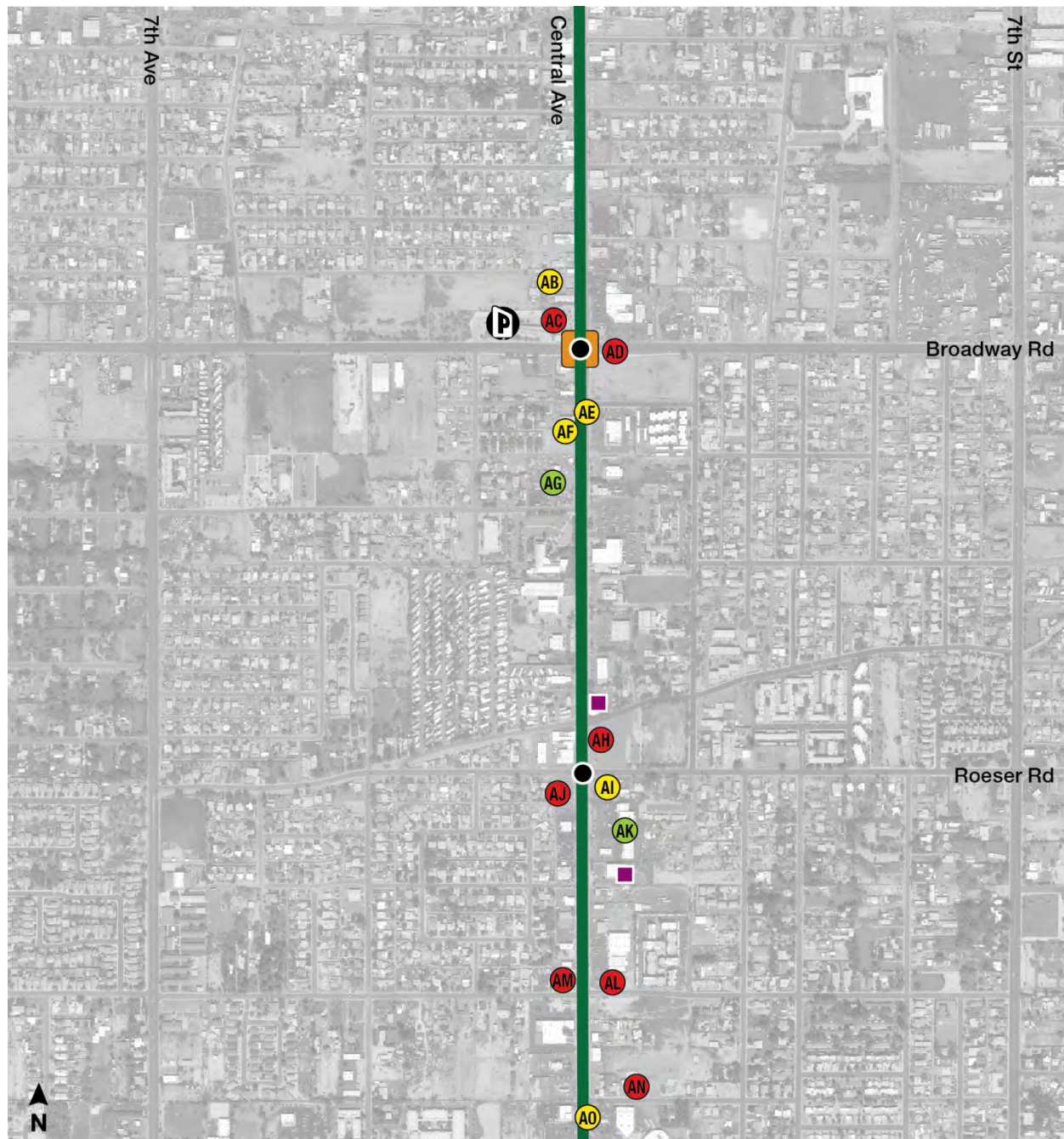
**FIGURE 3-21: POTENTIAL SITES OF CONCERN,
INTERSTATE 17 TO SOUTH OF SALT RIVER**



LEGEND

 Valley Metro Rail	 Flared Intersection	Risk Level
 South Central Light Rail Extension	 Potential Park-and-Ride	
 Proposed Station	 Potential TPSS	
		 High  Moderate  Low  Indeterminate

**FIGURE 3-22: POTENTIAL SITES OF CONCERN,
BROADWAY ROAD TO SOUTH OF ROESER ROAD**



LEGEND

 Valley Metro Rail	 Flared Intersection	Risk Level	
 South Central Light Rail Extension	 Potential Park-and-Ride	 High	 Low
 Proposed Station	 Potential TPSS	 Moderate	 Indeterminate

**FIGURE 3-23: POTENTIAL SITES OF CONCERN,
SOUTHERN AVENUE TO BASELINE ROAD**



LEGEND

 Valley Metro Rail	 Flared Intersection	Risk Level	
 South Central Light Rail Extension	 Potential Park-and-Ride	 High	 Low
 Proposed Station	 Potential TPSS	 Moderate	 Indeterminate

TABLE 3-37: HIGH-RISK POTENTIAL SITES OF CONCERN

Map Code ^a	Property Name ^b	Property Address ^b	Property Details ^c
A	Maricopa County West Jackson Facility	101 W Jackson St	- Currently Sun-Ray Chemical Co. (current generator of hazardous materials) - Listed in AZ Spills, LUST, UST, EMAP, RGA LUST and FINDS databases - LUST case closed Oct. 21, 1998
B	Arizona Plating and Anodizing	618 S Central Ave	Listed in EDR US Historic Cleaners, Spills, AZ SHWA, EMAP, CERC-NFRAP, RCRA-LQG, ICIS, ERNS, FTTS, HIST FTTS and FINDS databases
C	Mission Uniform Services	621 S First Ave	- Listed in AZ Drycleaners, EMAP, UST and FINDS databases - UST removed Set. 1, 1986
D	Miranda's Custom Cars	706 S Central Ave	- Listed in Historic Auto Station, LUST, UST, FINDS and EMAP databases - UST removed Jun. 8, 2006
E	OD Cleaners	824 S Central Ave	Listed in AZ Drycleaners database
F	Circle K #2701843	1027 S Central Ave	- Listed in LUST, UST, Historic Auto Station, EMAP and FINDS databases - LUST closed May 23, 2006
P	Salvation Army Adult Rehabilitation Center	1625 S Central Ave	- Listed in UST and LUST databases - LUST cases closed Oct 11, 2000 and UST removed May 24, 1995
S	Quick Turn Circuits	1829 S Central Ave	Listed in CERCLIS, RCRA NonGen/NLR, EMAP, FINDS and AZ SHWS databases
W	City of Phoenix Police South Resource Bureau	3443 S Central Ave	- Listed in Historic Auto Station, Dry Wells, LUST, UST, RCRA-CESQG, Manifest and AZURITE databases - LUST case closed Nov. 18, 1999; 4 of 10 USTs removed Jun. 2, 1989
Z	Al's Service Station	3701 S Central Ave	Listed in Historic Auto Station database
AC	Ed Pastor Transit Center	16 W Broadway Rd	- Listed in LUST, UST, Dry Wells, US Historic Cleaners, EMAP and FINDS databases - LUST closed on Dec. 5, 2011
AD	Schneider's Garage	15 E Broadway Rd	Listed in Historic Auto Station database
AH	Windsor Cleaners	5035 S Central Ave	Listed in US Historic Cleaners and AZ Drycleaners databases
AJ	Circle K #1247	5202 S Central Ave	- Listed in LUST, UST, Historic Auto Station, EMAP and FINDS databases - LUST closed May 23, 2006
AL	Firestone #2631	5449 S Central Ave	- Listed in RCRA NonGen/NLR, LUST, UST, EMAP and FINDS databases - LUST closed Oct. 21, 1993

Map Code ^a	Property Name ^b	Property Address ^b	Property Details ^c
AM	Mobile #109	5448 S Central Ave	- Currently a Shell - Listed in UST, Historic Auto Station, EMAP and FINDS databases 6 of 10 USTs removed Jul. 10, 1998
AN	James Bond Trucking	12 E Hidalgo Ave	- Listed in RCRA NonGen/NLR, LUST, UST, AZURITE, EMAP and FINDS databases - LUST closed Mar. 6, 1998
AS	Jackson Hewitt Tax Services	6076 S Central Ave	- Location of former Sam's Gas Station - Listed in AZ SPILLS, Historic Auto Station, LUST and UST databases - LUST case closed Dec. 12, 2006 and another closed Jan. 20, 2011; UST removed Aug. 19, 1993
AT	Corral Cleaners	6245 S Central Ave	Listed in RCRA-SQG, AZ Drycleaners, US Historic Cleaners, AZ Manifest, EMAP and FINDS databases
AV	Arco #5736	7602 S Central Ave	- Listed in UST, RCRA NonGen/NLR, EMAP and FINDS databases - USTs removed Aug. 29, 2003
AW	Circle K #2708517	7601 S Central Ave	- Listed in LUST, UST, Historic Auto Station, AZURITE, EMAP and FINDS databases - LUST closed May 8, 1996; four of seven USTs removed

Sources: EDR (2015) and *Phase I Environmental Site Assessment* (see Appendix J)

^a See Figures 3-20 to 3-23.

^b Property names and address are shown as identified in the EDR report; see Appendix J.

^c See Appendix J for descriptions of the databases.

TABLE 3-38: MODERATE-RISK POTENTIAL SITES OF CONCERN

Map Code ^a	Property Name ^b	Property Address ^b	Property Details ^c
H	OD Dry Cleaners	1220 S Central Ave	Listed in US Historic Cleaners database
I	Gas Station	1273 S Central Ave	Listed in Historic Auto Station database
J	R and M Roofing	1315 S Central Ave	Listed in AZ Spills database
K	Arizona Pump and Supply	1308 S Central Ave	Listed in Historic Auto Station and AZ SHWS databases
L	Interstate Parts and Machine	1321 S Central Ave	Listed in AZ SHWS database
M	Axle Transmission of Arizona	1401 S Central Ave	- Listed in Historic Auto Station, FINDS, SHWS, UST, EMAP and RCRA NonGen/NLR databases - UST removed Feb. 2, 1990

Map Code ^a	Property Name ^b	Property Address ^b	Property Details ^c
O	Salvation Army Auto Resale Center	1524 S Central Ave	- Listed in Historic Auto Station, FINDS, LUST, UST and EMAP databases - LUST cases closed Nov 12, 1996; 2 USTs removed Nov. 15, 1989
Q	JP Phillips	1624 S Central Ave	- Listed in LUST, UST, EMAP and FINDS databases - LUST closed Dec. 29, 1999
R	Cardlock Fuel	1802 S Central Ave	- Listed in LUST, UST, EMAP and FINDS databases - LUST cases closed Jan. 11, 1994; case closed Dec. 4, 2006; USTs removed Jan. 6, 1998
V	United Metro Materials	2800 S Central Ave	- Listed in FTTS, Historic FTTS, RCRA NonGen/NLR, US Mines, FINDS, LUST, UST, AZ Brownfields and EMAP databases - LUST case closed Aug. 25, 1988, 3 cases on Aug. 29, 2002, and another on Sep. 20, 2002 - USTs removed on Jan. 1, 1980, Mar. 11, 1994, (2 USTs), Jun. 1, 1997, Dec. 19, 1998 (5 USTs), Mar. 4, 1991 (5 USTs), Jun. 9, 1994 (2 USTs)
Y	Arizona Alternator Rebuilders	3615 S Central Ave	Listed in RCRA NonGen/NLR, FINDS, EMAP and Historic Auto Station databases
AB	RA Cleaners	4302 S Central Ave	Listed in US Historic Cleaners and AZ Drycleaners databases
AE	Budget Cleaner	4521 S Central Ave	Listed in US Historic Cleaners and AZ Drycleaners databases
AF	Larry's Auto Service	4506 S Central Ave	- Listed in EMAP, UST, FINDS and Historic Auto Station databases - UST removed Aug. 22, 1996
AI	Allen Drive-in Cleaners	40 E Roeser Rd	Listed in US Historic Cleaners and AZ Drycleaners databases
AO	Pepboys #627	5813 S Central Ave	- Listed in RCRA NonGen/NLR, FINDS, LUST, UST and EMAP databases - LUST closed May 21, 1996
AP	Farah Laundromat	5834 S Central Ave	- Listed in Historic Auto Station, FINDS, RCRA NonGen/NLR, FINDS, UST, US Historic Cleaners, AZ Drycleaners and EMAP databases - UST removed Mar. 2, 1993
AQ	Tuneup Masters	5850 S Central Ave	- Listed in RCRA-CESWG, FINDS, UST, EMAP and Historic Auto Station databases - UST removed Jan. 1, 1989
AR	Southern Avenue Cleaners	17 E Southern Ave	Listed in US Historic Cleaners and AZ Drycleaners databases

Sources: EDR (2015) and *Phase I Environmental Site Assessment* (see Appendix J)

^a See Figures 3-20 to 3-23.

^b Property names and address are shown as identified in the EDR report; see Appendix J.

^c See Appendix J for descriptions of the databases.

TABLE 3-39: LOW-RISK POTENTIAL SITES OF CONCERN

Map Code ^a	Property Name ^b	Property Address ^b	Property Details ^c
G	Coca Cola Facility	1301 S Central Ave	- Listed in LUST, UST, EMAP and FINDS databases - UST closed Nov. 8, 2005
N	Central Tire	1500 S Central Ave	Listed in SHWS and Historic Auto Station databases
T	I-10 International Trucking	2202 S Central Ave	- Listed in FINDS, RCRA NonGen/NLR, LUST, UST and EMAP databases - UST closed Sep. 7, 2005
U	Central Avenue Landfill	Central Ave/ Watkins St	- Listed in FINDS, AZ WWFAC, EMAP, UST and CERC-NFRAP databases - UST removed Feb. 10, 1987, Feb. 28, 1987, and Jun. 23, 1987
AG	South Phoenix Neighborhood Projects	4616 S Central Ave	Listed in US Brownfields, VCP, EMAP, RCRA-CESQS and FINDS databases
AK	Wash N Cleaners	5233 S Central Ave	Listed in US Historic Cleaners and AZ Drycleaners databases
AU	Savco #5	15 E Baseline Rd	- Listed in LUST, UST, AZURITE and EMAP databases - UST cases closed Dec. 12, 1991 - USTs removed Nov. 18, 1991

Sources: EDR (2015) and *Phase I Environmental Site Assessment* (see Appendix J)

^a See Figures 3-20 to 3-23.

^b Property names and address are shown as identified in the EDR report; see Appendix J.

^c See Appendix J for descriptions of the databases.

TABLE 3-40: INDETERMINATE-RISK POTENTIAL SITES OF CONCERN

Map Code ^a	Property Name ^b	Property Address ^b	Property Details ^c
X	Vacant	3501 S Central Ave	- Listed in FINDS, UST, EMAP and Historic Auto Station databases - UST removed Mar. 16, 2001
AA	Gateway Manufacturing	12 E Raymond St	Listed in EMAP and FINDS databases

Sources: EDR (2015) and *Phase I Environmental Site Assessment* (see Appendix J)

^a See Figures 3-20 to 3-23.

^b Property names and address are shown as identified in the EDR report; see Appendix J.

^c See Appendix J for descriptions of the databases.

The area surrounding the McKinley Street loop consists of a mix of residential and commercial properties. The environmental database search identified 178 properties within one-quarter mile of the loop. LUST and dry cleaner listings were noted within one-quarter mile, but each listed site was at a sufficient distance (or in a hydraulically down-gradient or cross-gradient position) from the McKinley Street loops. Therefore, no sites were determined to be of concern for this Build Alternative element.

The area surrounding the OMC consists of industrial land uses. The environmental database search identified 33 listings within one-quarter mile of the OMC. Dry cleaner and UST listings were located within that radius, but each listed site was at a sufficient distance (or in a hydraulically down-gradient or cross-gradient position) from the OMC. Based on these factors, the sites were determined to not be of concern to the OMC expansion.

3.15.2 No-Build Alternative

The No-Build Alternative represents conditions in 2035 if the South Central Light Rail Extension is not built and is defined as the existing transit and roadway/highway system plus programmed (committed) transportation improvement projects, as discussed in Section 2.2.1.

No adverse impacts are anticipated as a result of the No-Build Alternative because this alternative includes only those improvements to the transportation network that have already been approved and included in the MAG RTP or the City of Phoenix *Capital Improvement Plan*. Appropriate measures would be included in those projects to avoid or mitigate for adverse impacts.

3.15.3 Build Alternative

A Corridor Phase I Environmental Site Assessment (ESA) was conducted for the Build Alternative, including the McKinley Street loop and the OMC, both of which are not within the Build Alternative's main South Central Avenue alignment corridor. The McKinley Street loop is approximately 0.7 mile north of the main corridor, and the OMC is approximately 6 miles east of the main corridor. As presented in Tables 3-37 to 3-40 and Figures 3-20 to 3-23, hazardous materials sites of concern are located throughout the corridor and the potential exists to encounter contamination during construction, which is a concern from both a worker safety and public exposure perspective. See Section 3.20 for an assessment of the construction impacts.

Of the sites presented in Tables 3-37 to 3-40, all the high-risk sites (21 sites) and one indeterminate-risk site warrant further investigation to verify the presence of actionable concentrations of suspect hazardous materials and to provide depth and concentration data to be considered in developing mitigation/remediation measures for specific contaminants (specific remedial actions vary by contaminant) (Table 3-41). As mentioned previously, these sites may contain hydrocarbons, heavy metals and/or dry cleaning solvents, all of which are toxic to humans at certain concentrations.

The need for additional investigation at these 22 locations is based on known or suspected contamination, and/or other details associated with the site's regulatory listing. For instance, vapor intrusion⁷ into buildings or utility corridors is a concern for the Build Alternative area, given the historic presence of service stations, dry cleaners and industrial facilities.

⁷ Vapor intrusion (that is, of solvents and/or hydrocarbons) generally occurs when volatile chemicals migrate from contaminated groundwater or soil into an overlying building. Such volatile chemicals can emit vapors that may migrate into indoor air spaces of overlying buildings in ways similar to that of radon gas seeping into homes (EPA 2015b).

**TABLE 3-41: PROPERTIES FOR ADDITIONAL
HAZARDOUS MATERIALS EVALUATION**

Map Code ^a	Property Name	Property Address	Risk of Impact On Site	Potential Contaminant Encountered
A	Maricopa County West Jackson Facility	101 W Jackson St	High	Petroleum compounds
B	Arizona Plating and Anodizing	618 S Central Ave	High	Heavy metals and solvents
C	Mission Uniform Service	621 S 1st Ave	High	Dry cleaning solvents
D	Miranda's Custom Cars	706 S Central Ave	High	Petroleum compounds
E	OD Cleaners	824 S Central Ave	High	Dry cleaning solvents
F	Circle K #2701843	1027 S Central Ave	High	Petroleum compounds
P	Salvation Army Adult Rehabilitation Center	1625 S Central Ave	High	Petroleum compounds
S	Quick Turn Circuits	1829 S Central Ave	High	Heavy metals and solvents
W	City of Phoenix Police South Resource Bureau	3443 S Central Ave	High	Petroleum compounds
Z	Al's Service Station	3701 S Central Ave	High	Petroleum compounds
AA	Gateway Manufacturing	12 E Raymond St	Indeterminate	Volatile and semivolatile organic compounds and metals
AC	Ed Pastor Transit Center	16 W Broadway Rd	High	Petroleum compounds
AD	Schneider's Garage	15 E Broadway Rd	High	Petroleum compounds
AH	Windsor Cleaners	5035 S Central Ave	High	Dry cleaning solvents
AJ	Circle K #1247	5202 S Central Ave	High	Petroleum compounds
AL	Firestone #2631	5449 S Central Ave	High	Petroleum compounds
AM	Mobil #109 (currently a Shell)	5448 S Central Ave	High	Petroleum compounds
AN	James Bond Trucking	12 E Hidalgo Ave	High	Petroleum compounds
AS	Jackson Hewitt Tax Services	6076 S Central Ave	High	Petroleum compounds
AT	Corral Cleaners	6245 S Central Ave	High	Dry cleaning solvents
AV	ARCO #5736	7602 S Central Ave	High	Petroleum compounds
AW	Circle K #2708517	7601 S Central Ave	High	Petroleum compounds

^a See Figures 3-20 to 3-23.

Based on the operation of facilities such as dry cleaners and service stations surrounding the Build Alternative area, a higher than normal potential exists for undiscovered hazardous materials in the area and anywhere ground-disturbing activity occurs near a site of concern (Tables 3-37 to 3-40 and Figures 3-20 to 3-23).

The Motorola 52nd Street Superfund Site extends beneath the northern end of the Build Alternative area; however, groundwater at an average depth of 275 feet below ground surface is too deep to be affected by the Build Alternative since the deepest excavation

would be approximately 20 feet. No supply wells are in the vicinity of the Build Alternative and are, therefore, not of concern.

The traffic analysis (Section 3.6.3) identified three intersections for traffic mitigation that warrant hazardous material consideration. The two intersections at I-17 (7th Avenue and 7th Street) have existing and former gas stations, indicating an elevated risk for contamination in near-surface soil. The 7th Street and I-17 location involves relocation of a signal head, which could require excavations from 2 to 4 feet deep and thus warrants mitigation. The 7th Avenue and I-17 location would also invoke mitigation measures because the scope of work at that location includes utility relocation and significant ground disturbance. Similar development conditions were present at 7th Avenue at Southern Avenue, since the northwestern and southwestern corners of the intersection include active and former gas stations. Mitigation measures would not be required for this location based on the scope of improvements at that location (no ground-disturbing activities).

No hazardous materials impacts are expected from construction of the OMC expansion or the McKinley Street loop

The Build Alternative would require the acquisition and demolition of buildings, or the refacing of buildings and potential modifications to weight-bearing structures (that is, bridges). Given the age of construction of most buildings and transportation features in the Build Alternative area, it is likely that lead-based paint and asbestos-containing building materials are present in three buildings (1831 South Central Avenue, 2125 South Central Avenue and 722 South Central Avenue) in the main corridor, one associated with a TPSS (1524 South Central Avenue) and two bridges (Jackson Street bridge and Central Avenue bridge).

Contact with hazardous materials (including released contaminants such as hydrocarbons, dry cleaning solvents, heavy metals and asbestos) may adversely affect the health of workers or members of the public exposed to the contaminant. Impacts on humans vary, depending on the contaminant and the concentrations encountered. Procedures exist to mitigate, remediate or otherwise nullify the impacts of exposure to hazardous materials.

3.15.4 Mitigation

The following mitigation measures would be implemented to verify the presence of hazardous materials, refine mitigation measures and minimize potential for encountering hazardous materials during construction. With implementation of mitigation measures, no adverse impacts are expected from the Build Alternative.

- To verify the presence of hazardous materials and refine mitigation, Valley Metro would perform Preliminary Site Investigations (PSIs) at the 22 sites listed in Table 3-41. As part of the PSIs, drilling, sampling and a targeted analytical program (that is, laboratory analysis) would be performed to determine the severity and extent of contaminants, if present, that would likely be disturbed by construction. If hazardous materials are found at these sites, it is likely that the impacted soils would be excavated and disposed of at an appropriate facility (determined based on laboratory results).

- The City of Phoenix would conduct parcel-specific Phase I ESAs for properties identified for full or partial acquisition (prior to acquisition of the property) to verify impacts and refine mitigation (that is, 621 South 1st Street and 1027, 5202, 7601 and 7602 South Central Avenue).
- Environmental construction monitoring should be conducted along the entire length of the Build Alternative corridor, at the intersection of 7th Avenue and I-17 and at the intersection of 7th Street and I-17 during signal head relocation.
- In the event that potentially hazardous materials are encountered, an odor is identified or significantly stained soil is noted, all construction Contractors would be instructed to immediately stop all subsurface activities in the potentially affected area. Contractors would conform to Valley Metro's Master Specifications 01.35.30, Unknown Hazardous and Contaminated Substances, which, in addition to stopping construction, require that 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 a Contaminated Media Management Plan. The general procedures initiated for discovery of hazardous materials once construction in the area has stopped are to (1) monitor for impacted conditions; (2) coordinate/consult with appropriate regulatory agencies; (3) initiate specific hazardous materials management plans, including appropriately trained staff, segregation of potentially impacted media, sampling and analysis of material to determine appropriate handling/transport/disposal and preparation of waste manifests for tracking of waste and (4) documentation of waste disposal, site conditions and any protective measures for public or construction workers that were employed. 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.
- To verify the presence of hazardous materials and refine mitigation, Valley Metro would assess building materials and weight-bearing structures (bridges) that would be disturbed by construction for asbestos-containing building materials and lead-based paint prior to construction. If the assessment finds asbestos or lead, then abatement of these materials under an Abatement Plan would be performed by a qualified Contractor prior to demolition or alteration of the structures.
- Valley Metro would develop and implement Abatement Plans (for lead-based paint and asbestos-containing building materials) following results of the PSI investigation and asbestos/lead paint assessments.

3.16 SAFETY AND SECURITY MEASURES

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

3.16.1 Environmental Setting

The proposed Build Alternative route would travel through the dense urban environment of Downtown Phoenix and the lower density residential environment of South Phoenix. The City of Phoenix provides 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:

- Phoenix Memorial Hospital (7th Avenue and Buckeye Road)
- Travis L. Williams Family Services Center (Tamarisk Avenue and Central Avenue)
- Phoenix Fire Department Station 22 (Roeser Road and 3rd Street)
- Phoenix Police Department – South Mountain Precinct (Southern and 4th Avenues)

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 proposed light rail would be located within a designated fixed guideway, separated from vehicular traffic by a physical barrier. At intersections, appropriate signal timing, warning instruments (for example, crossing signals with flashing lights) and other measures would be implemented to avoid adverse impacts on pedestrian and vehicle safety crossing the tracks.

3.16.3.1 Security Protection Safety Services

The design criteria for Valley Metro projects require that light rail stations be designed in accordance with Crime Prevention Through Environmental Design guidelines. Both the light rail vehicles and stations would be designed in accordance with the Americans with Disabilities Act. Closed-circuit television would be provided at the station platforms, ticket vending machines and park-and-ride facilities. In addition, the stations would have emergency call boxes that would be connected to Valley Metro's Operations Control Center, which would have direct communication with the City of Phoenix police and fire departments. The U.S. Department of Homeland Security also requires all such facilities to install U.S. Department of Homeland Security-compliant trash cans that are either resistant to explosives or that use an open metal frame and clear bag.

The light rail vehicles would include passenger emergency reporting devices that allow passengers to communicate with the train operator. The vehicle interior and exterior would also be equipped with closed-circuit television. The train operator could report problems directly to the Valley Metro Operations Control Center, which could then contact security or local police. Light rail vehicles would include bells, horns and flashing headlights to provide both audible and visual warnings as needed to alert drivers and pedestrians of an approaching train. In addition, the vehicles would be designed with energy-absorbing bumpers to lessen potential impacts in the event of a collision. The vehicle would also have low ground clearance, which would reduce the likelihood of a pedestrian sliding underneath the train in the event of a collision.

Valley Metro design standards require certain features 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. The station platforms would be marked with “Do Not Cross Tracks” and signs to direct pedestrians to the proper crossing location would be incorporated into the Build Alternative design.

Security personnel would patrol the stations and trains. Security services for the proposed 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. The train operators and security personnel would be trained to spot potentially suspicious activities and to take appropriate action. The City of Phoenix Police Department would respond to criminal incidents and automobile or pedestrian accidents with the light rail vehicle, etc., while the City of Phoenix Fire Department would respond to fire and rescue emergencies.

3.16.3.2 Fire Protection and Emergency Medical Services

Light rail vehicles would yield to fire and emergency medical service vehicles at intersection crossings or anywhere else along the guideway.

The final design would include guideway designed in accordance with the Valley Metro Design Criteria Manual, National Fire Protection Association NFPA-130 (Standard for Fixed Guideway Transit and Passenger Railway Systems) and applicable fire and building codes. Emergency egress provisions would be provided at a maximum spacing of 2,500 feet for below grade and elevated guideway sections.

3.16.3.3 Pedestrian Safety

To minimize the accident potential for students attending nearby schools, Valley Metro would conduct a safety education program to target elementary and junior high school students. The program would be similar to that carried out prior to operation of the existing light rail in operation. That program included distribution to the schools of age-appropriate safety-related materials such as coloring books, word hunts, crossword puzzles, maze worksheets, bookmarks and build-your-own-train with safety messages. In addition, Valley Metro maintains a website that allows anyone accessing the site to download most of the materials and includes a link for school teachers or administrators to request Valley Metro staff to make a presentation to their classrooms:

www.valleymetro.org/safety/kids_safety_spot

In addition, Valley Metro, as part of its standard procedures for initiating new services, would work with the City and local organizations to educate riders, auto drivers, bicyclists and pedestrians about safety and security along the planned extension. This would include advertising, social media and other outreach efforts to explain how the light rail interacts with automobile traffic, bicycle lanes and pedestrian activities. This program would begin during the initial testing phase of operations and would work hand-in-hand with other safety and security outreach efforts for the regional transit system.

3.16.3.4 Safety and Security Plans

Valley Metro has established a set of comprehensive security activities emphasizing the importance of security in all aspects of the Light Rail Transit Starter Line system and

associated extensions. These activities are documented in the following plans and will be updated to include the light rail extension:

- 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 regulations at 49 CFR Part 659 and with Arizona Department of Transportation (ADOT) guidelines.
- System Safety Program Plan (Revision 11, 2015) – Establishes requirements for identifying, evaluating and minimizing safety risks for all Valley Metro systems and complies with FTA regulations at 49 CFR Part 659 and with 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 that may come in contact with the system.

Valley Metro's Office of Safety and Security would conduct, in cooperation with the local responding police agency, a Threat and Vulnerability Assessment as part of the safe and secure operation of the extension. This would occur in conjunction with continued cooperation through a Regional Security Team consisting of law enforcement personnel system-wide to track, trend and respond to incidents along the entire system. The Office of Safety and Security would also continually evaluate safety and security elements for the South Central Light Rail Extension, including, but not limited to, the following:

- Threats and hazards associated with the light rail extension
- Design and architectural details to enhance safety
- Use of closed-circuit television cameras and lighting as specific design measures
- Security patrols of transit property and vehicles
- Ongoing train safety awareness education

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 WETLANDS, NAVIGABLE WATERS AND FLOODPLAINS

3.17.1 Environmental Setting

Wetlands and waters of the United States (WOUS) are subject to the jurisdiction of the U.S. Army Corps of Engineers (USACE) under authority of Section 404 of the Clean

Water Act (CWA) of 1972 (as amended). WOUS include navigable waters, lakes, ponds, stream channels, dry washes in the arid Southwest and wetlands. Wetlands are defined as “Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions” [33 CFR Part 328.3(b)]. Wetlands are a subset of WOUS.

The Salt River is the only WOUS in the study area. The Salt River originally flowed naturally through the area prior to the installation of upstream impoundments and diversions. Current stream flow, when present, is ephemeral,⁸ influenced by groundwater withdrawals, treated sewage effluent discharges, diversions for irrigation, return flow from irrigated areas and occasional floodwater releases from upstream dams (City of Phoenix 2015b). Open water and temporarily flooded streambeds occur in the Salt River. One such area, a large open water pool, occurs directly beneath the Central Avenue bridge. Open water exists here only because it is pumped in to support vegetation associated with the RSHRA, a riparian habitat and wetland restoration project completed by the City of Phoenix and USACE in 2005.⁹ Wetland vegetation is most prevalent along the edges of this open water and across the low-lying areas in the Salt River low-flow channel where water is pumped. The area of the Salt River/RSHRA is further characterized as having developed areas such as roads, trails and bridge abutments and undeveloped naturally vegetated uplands consisting of typical dry Sonoran Desert habitat mixed with nonnative grasses and forbs.

Non-WOUS in the study area include an isolated demonstration wetland on an upland terrace approximately 300 feet from the Salt River channel with no connection to a navigable water, a condition of WOUS; a human-made drainage feature for collecting stormwater runoff that flows along the northern side of the OMC; the Western Canal and the Grand Canal. The Western Canal is a 6-foot-wide concrete-lined canal that crosses the Build Alternative just north of Baseline Road and the Grand Canal is a 45-foot-wide concrete-lined canal adjacent to the OMC. These human-made water features are not subject to USACE jurisdiction.

Related to the major water features in the study area (Salt River, Grand Canal and Western Canal) are floodplains. Federal agencies are required to consider direct and indirect impacts on floodplains that may result from federally funded actions. EO 11988, Floodplain Management, requires federal agencies to take action to minimize occupancy and modification of 100-year floodplains. The 100-year flood, also known as the base flood, is caused by a flood with a probability of occurring once every 100 years. The area where it occurs is referred to as the 100-year floodplain. The regulatory floodway is the portion of the floodplain area reserved by federal, state and/or local requirements in an unconfined and unobstructed manner to provide for discharge of a base flood so that the overall increase in water surface elevation is no more than 1 foot (not a significant increase), as established by the Federal Emergency Management Agency (FEMA). To identify the locations and extent of 100-year floodplains in the study area, FEMA Flood Insurance Rate Maps (FIRMs) were

⁸ Ephemeral waters flow only after rainstorms.

⁹ The City of Phoenix uses five wells to pump water from a nonpotable aquifer directly into the RSHRA. Additionally, 22 storm drains flow into the RSHRA/Salt River low-flow channel.

reviewed.¹⁰ Where there is a floodplain in the study area, it is classified as a Zone AE 100-year floodplain/floodway associated with the Salt River, or Zone A, associated with the canals (Figures 3-24 and 3-25).

3.17.2 No-Build Alternative

Under the No-Build Alternative, no direct impacts to WOUS or floodplains would occur. However, continued development may create the need for additional roadway crossings over the Salt River and encroachment into the floodplains.

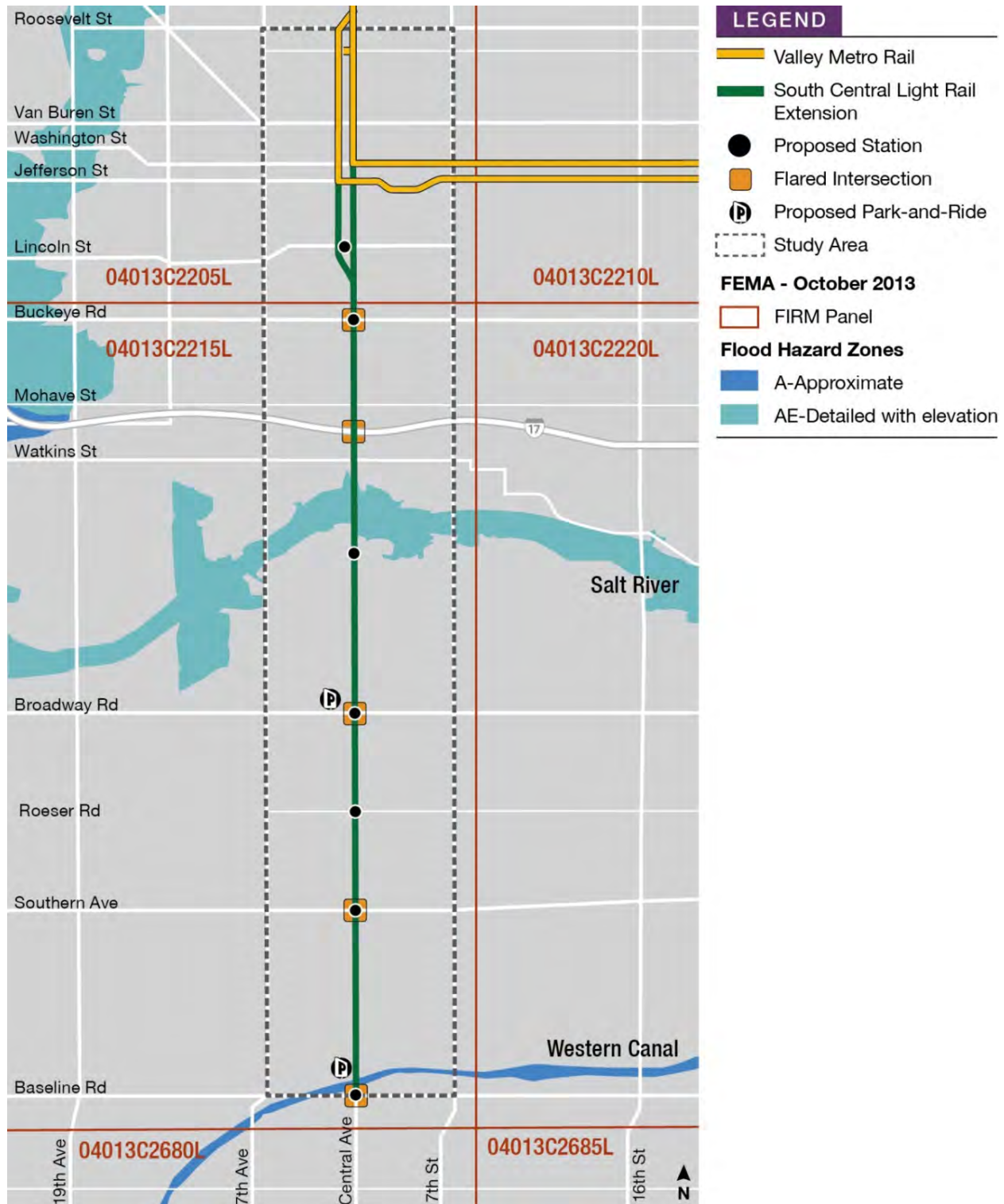
3.17.3 Build Alternative

The Build Alternative would cross the Salt River using the Central Avenue bridge. The current Central Avenue bridge cannot support the additional, periodic weight of light rail vehicles; therefore, constructing the Build Alternative would require retrofitting the existing bridge over the Salt River and the RSHRA. To retrofit the bridge, the center portion of the bridge deck and concrete girders would need to be removed and replaced. The retrofit would also excavate an area around each of the nine bridge piers to access the bridge foundations. The base dimensions of the pier footers (foundation) would not increase; instead each footing would be thickened vertically with additional concrete (Figure 3-26). For the two piers in open water and in wetlands, the work would occur well below the streambed, and the area above it would be restored to preconstruction conditions. No permanent acreage loss of WOUS or wetlands would occur. Accessing the bridge foundations would require temporarily removing the open water around the two center piers by installing cofferdams or sandbags and pumping the standing water from inside the cofferdams. Finally, a 50-foot-wide temporary access road would need to be constructed adjacent to the entire bridge and within the Salt River and RSHRA. This temporary road would provide access to cranes and other construction vehicles to assist in the replacement of bridge girders and other structures. Construction of the temporary road would require fill in, and the subsequent restoration of, wetlands and WOUS created by the RSHRA.

Impacts on WOUS would include the temporary discharge of fill into 0.16 acre of wetlands, 0.60 acre of open water plus a small unvegetated, rocky stream bed. All construction activities and ground disturbance (constructing the temporary access road, removing the bridge deck, replacing the four bridge girders and enhancing the pier footers) within the Salt River channel would be temporary, lasting 10 months or less. Construction activities at the two piers within the wetland and open water areas would last 6 months or less. Construction activities would start with the two piers within the wetlands and open water to minimize the duration of construction activities at this location. This short construction duration, coupled with reclaiming and restoring the area to preconstruction conditions following completion of bridge construction, would result in no permanent acreage loss of WOUS or wetlands. Figure 3-27 presents the temporary impacts on WOUS.

¹⁰ FIRM panels 04013C2680L, 04013C2205L, 04013C2215L, 04013C2230L and 04013C2240L, all dated October 16, 2013, delineate floodplains in the Build Alternative.

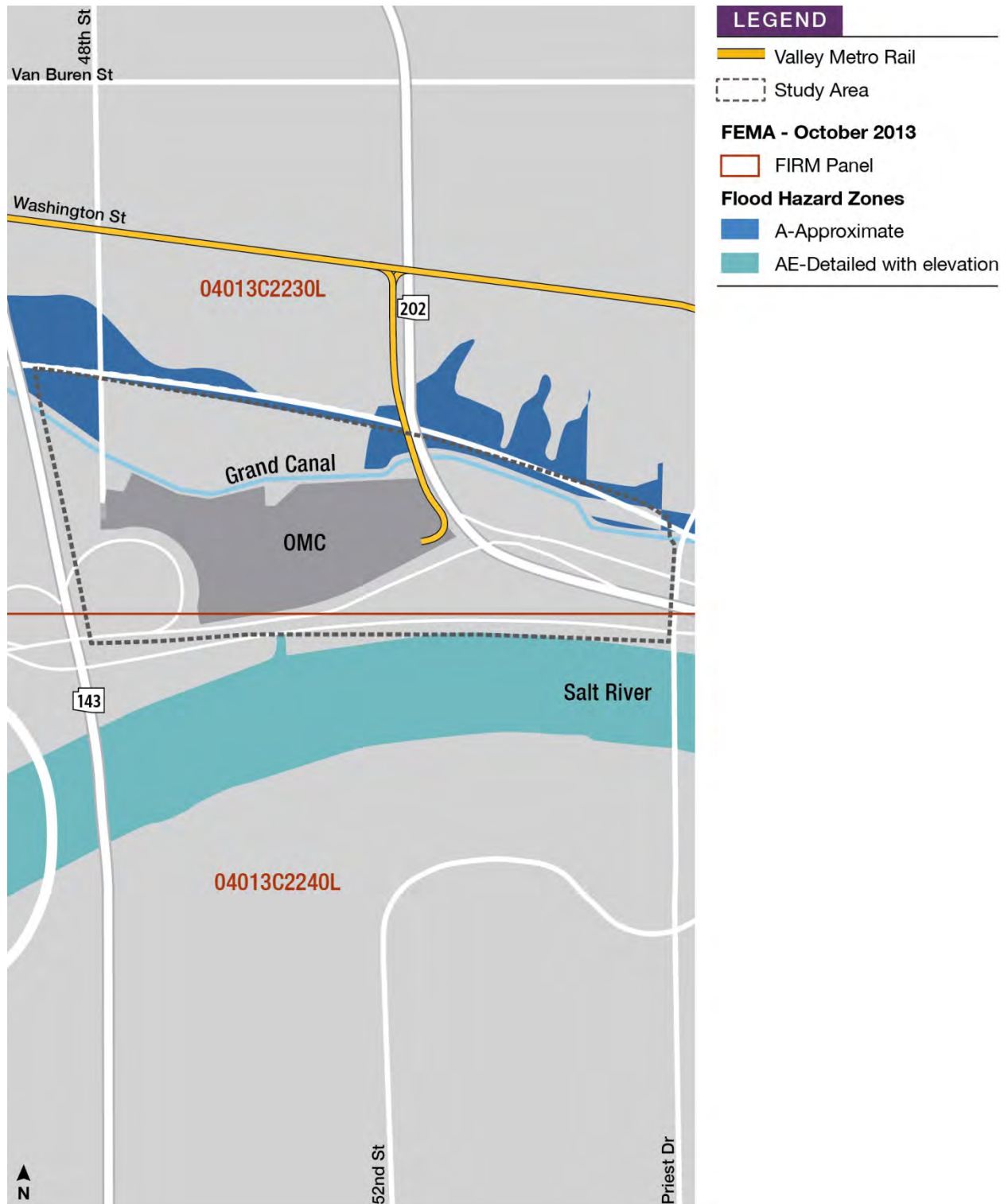
**FIGURE 3-24: FLOODPLAIN/FLOODWAY HAZARD ZONES
ALONG THE BUILD ALTERNATIVE**



Source: Federal Emergency Management Agency (2015)

Note: Flood Hazard Zone "A-Approximate" indicates that the hazard zone was determined using approximate methods of analysis rather than detailed hydraulic analyses, which means that no base flood elevations or depths have been determined. Zone "AE-Detailed with elevation" means that base flood elevations and depths are derived from detailed hydraulic analyses.

**FIGURE 3-25: FLOODPLAIN HAZARD ZONES
NEAR OPERATIONS AND MAINTENANCE CENTER**



Source: Federal Emergency Management Agency (2015)

Note: Flood Hazard Zone "A-Approximate" indicates that the hazard zone was determined using approximate methods of analysis rather than detailed hydraulic analyses, which means that no base flood elevations or depths have been determined. Zone "AE-Detailed with elevation" means that base flood elevations and depths are derived from detailed hydraulic analyses.

Because of the involvement within wetlands and WOUS, the Build Alternative was introduced to USACE on September 2, 2015, and after its design had progressed, impacts and permitting needs were discussed with USACE on December 7, 2015. Because placement of temporary fill in wetlands and WOUS would occur, the Build Alternative would require a CWA Section 404 permit authorized by USACE. This permit, anticipated to be a Nationwide Permit, would follow the Nationwide Permit's Section 401 conditions, included with each permit, that are conditionally certified by the Arizona Department of Environmental Quality [ADEQ]. The permit would be applied for and approved by USACE prior to construction.

The Build Alternative would have no other impacts on wetlands or WOUS outside of the Salt River/RSHRA area.

Portions of the Build Alternative are within a 100-year floodplain. With the exception of the work in the Salt River, the Build Alternative is on an existing roadway alignment and thus would not substantially modify the topography; therefore, there would be no adverse effect on floodplains in these areas. The Salt River area would be graded to preconstruction elevations once construction is complete and thus the Build Alternative would not substantially modify the topography in this area either. Therefore, there would be no adverse impacts on floodplains from the Build Alternative.

FIGURE 3-26: RETROFIT OF THE CENTRAL AVENUE BRIDGE PIER FOOTERS

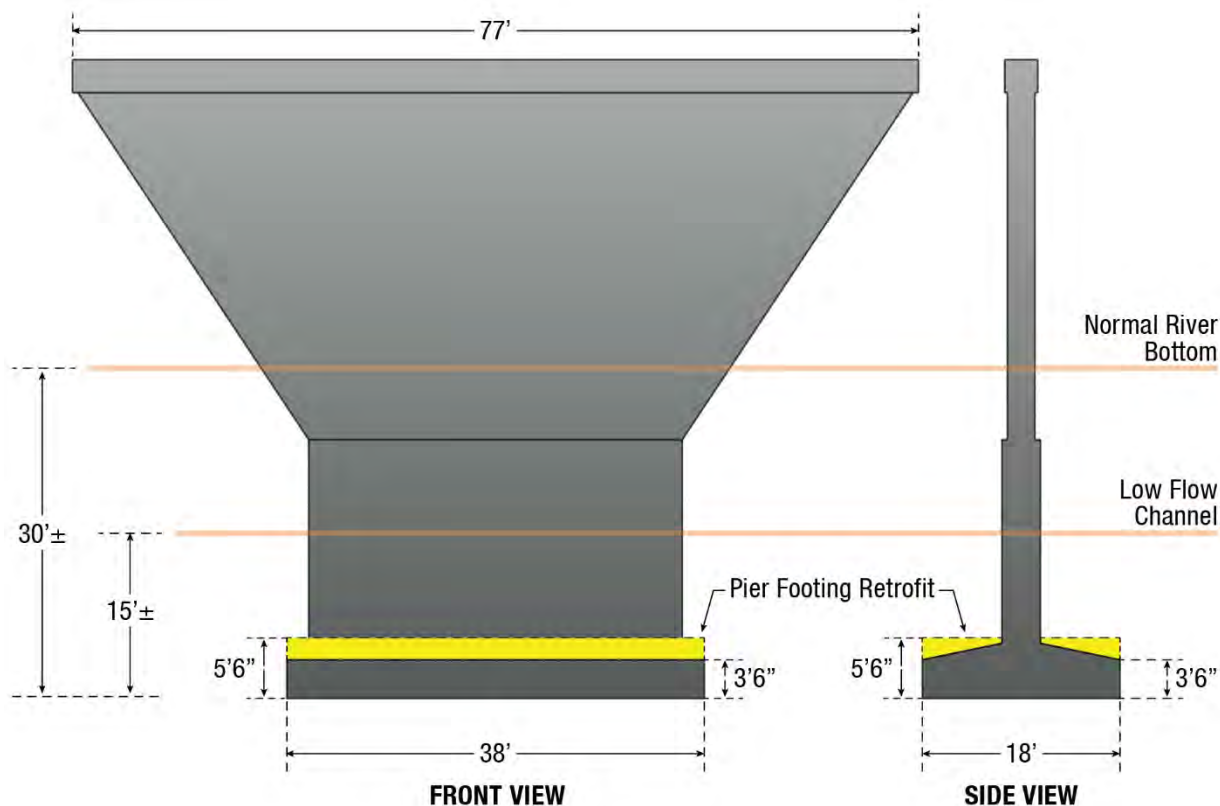
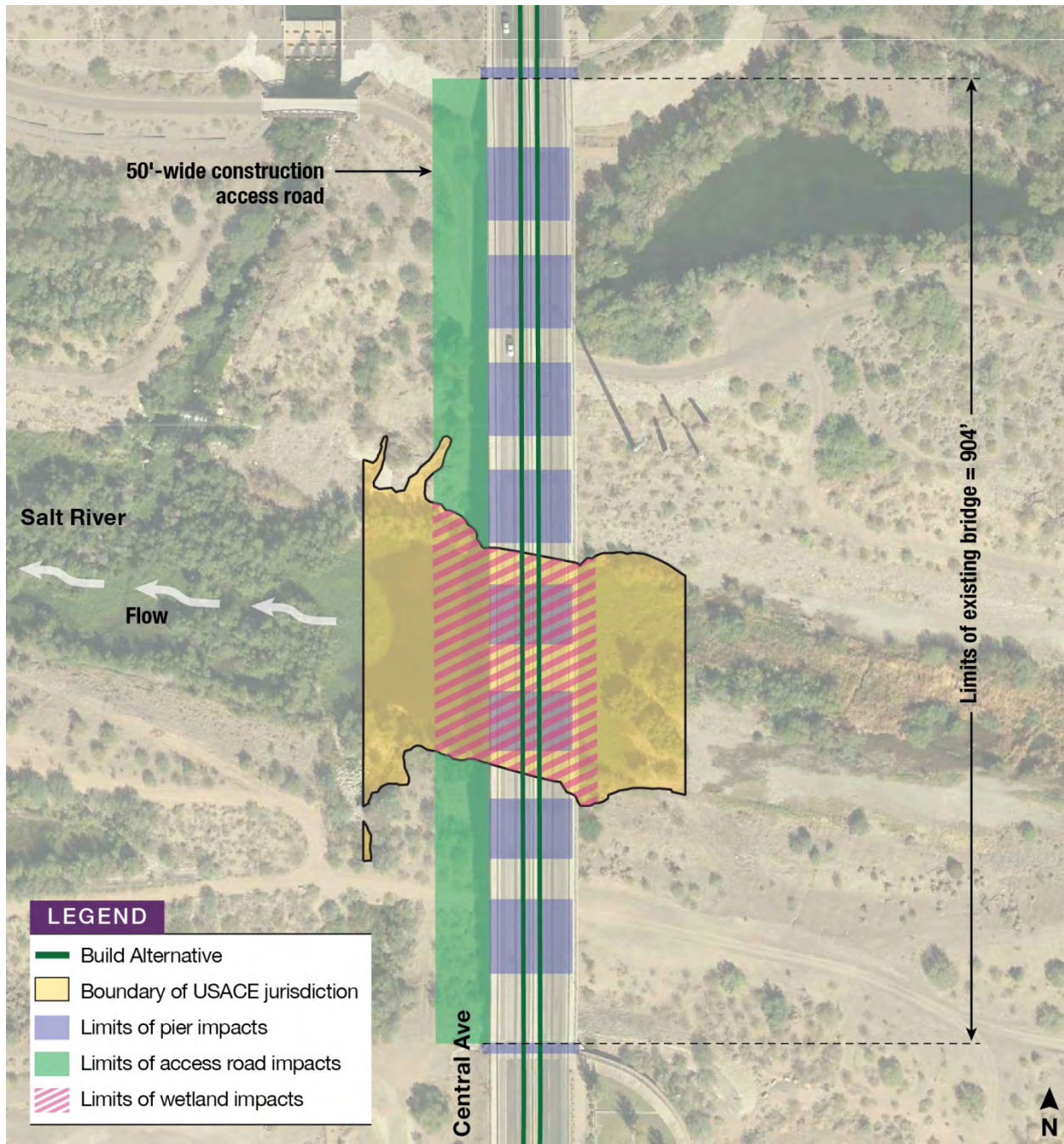


FIGURE 3-27: TEMPORARY IMPACTS ON WOUS



3.17.4 Mitigation

This section describes potential mitigation measures to avoid, reduce or mitigate impacts on wetlands, WOUS and floodplains associated with the Build Alternative.

- Valley Metro would prepare and submit an application to USACE for a CWA Section 404 permit for work in WOUS and wetlands.

- To protect WOUS, the Contractor shall comply with all terms and conditions of the Section 404 permit as established by USACE, including the associated Section 401 conditions, certified by ADEQ.
- Valley Metro would clearly identify the limits of the work area in wetlands and WOUS in the field (for example, by staking or flagging) prior to ground-disturbing activities. The Contractor would avoid all flagged and/or otherwise designated sensitive resource areas within or adjacent to the Build Alternative area.
- The Contractor would site temporary storage, staging, materials laydown and other work areas in uplands or previously disturbed areas to the extent possible.
- The Contractor would ensure that all equipment remains inside the identified Build Alternative limits and that it would not be stored, maintained or repaired in areas mapped as wetlands or WOUS.
- Valley Metro would develop a vegetation planting and habitat improvement plan during final design and in consultation with the City of Phoenix. The plan would incorporate plant species used for the RSHRA to replace vegetation, including wetland vegetation removed within the Salt River channel. The Contractor would restore water flow and circulation patterns of the Salt River following construction to allow the wetland to reestablish.
- The Contractor would develop and implement a Stormwater Control Plan that includes a Spill Prevention and Containment Measures Plan (staging areas, nonpoint source spills containment and clean up, concrete washout, etc.) for working within and adjacent to the Salt River channel and its wetlands.
- The Build Alternative is within a designated 100-year floodplain. Therefore, Valley Metro would provide an opportunity for the City of Phoenix floodplain manager to review and comment on design plans.

With implementation of the mitigation measures, the Build Alternative would have no adverse effect on wetlands, WOUS or floodplains.

3.18 WATER QUALITY

3.18.1 Environmental Setting

3.18.1.1 Surface Water

The Central Avenue bridge crossing of the Salt River is approximately 2 miles south of Downtown Phoenix. The river flows west into the Gila River, approximately 14 miles southwest of the crossing. The Salt River originally flowed naturally through this area prior to the installation of upstream impoundments and diversions. Current stream flow, when present, is now ephemeral, influenced by groundwater withdrawals, treated sewage effluent discharges, diversions for irrigation, stormwater flows from urban runoff and return flow from irrigated areas and occasional floodwater releases from upstream dams.

The Build Alternative corridor contains an open pool of water within the Salt River and an isolated demonstration wetland on upland terrace approximately 300 feet from the

Salt River channel but adjacent to the Central Avenue bridge; both are associated with the RSHRA. In addition, the Western Canal is near the southern end of the Build Alternative alignment, and the Grand Canal is adjacent to the northern boundary of the OMC.

The Arizona List of Outstanding Waters [Arizona Administrative Code R18-11-112(E)] and the Arizona 2012/2014 Section 303(d) List of Impaired and Not Attaining Waters were reviewed to determine whether outstanding or impaired waters are present. No outstanding, impaired or not-attaining waters are present near the Build Alternative corridor (ADEQ 2012).

3.18.1.2 Groundwater

Depths to groundwater in the vicinity of the Build Alternative vary substantially depending on land elevations and proximity to natural drainage areas. The average depth of groundwater in the study area is approximately 275 feet below ground surface (ADWR 2015a). Seven wells are within 100 feet of the proposed Build Alternative, ranging from approximately 37 to 83 feet deep (Table 3-42). Existing wells consist of geotechnical boreholes and water monitoring wells; no drinking water wells occur within 100 feet of the Build Alternative.

No aquifers, including designated principal or sole-source aquifers [Section 1424(e) of the Safe Drinking Water Act] are within the Build Alternative corridor (EPA 2015c).

TABLE 3-42: WELLS WITHIN 100 FEET OF THE STUDY AREA

Study Area	Owner	Type of Well	Well No.	Distance (feet)
Light rail extension	Private	Geotechnical	55-917399	37
	Arizona Department of Transportation	Geotechnical	55-510640	48
	Private	Geotechnical	55-911682	50
	Arizona Public Service	Monitoring	55-209460	50
	Maricopa County	Monitoring	55-516333	70
	Maricopa County	Monitoring	55-806797	75
	City of Phoenix	Monitoring	55-481986	81
Operations and Maintenance Center expansion	Salt River Project	Geotechnical	55-597668	40

3.18.2 No-Build Alternative

The No-Build Alternative would have no adverse impacts on water quality. There would be no construction that could create Build Alternative-related erosion or sediment deposits in existing surface waters or that could alter the existing groundwater. As urban growth continues, more development and more vehicular traffic would likely occur. This could result in increased pollutants from construction runoff and traffic on the surrounding street system.

3.18.3 Build Alternative

3.18.3.1 Surface Water

Light rail 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 is possible. Areas exposed to stormwater runoff could contribute small quantities of contaminants to the stormwater conveyance system and ultimately to natural water courses that drain to Salt River.

Although the Build Alternative is primarily in the existing ROW, it would add a small amount of impervious surface area in the study area from the addition of stations, TPSSs, park-and-rides and other improvements outside the existing ROW. The increase would be negligible relative to the total impermeable area that results from surrounding development. Stormwater runoff would not substantially increase as a result of the Build Alternative.

At the Salt River/RSHRA and associated wetlands, Impacts to surface water quality could result from construction activities (for example, soil erosion from exposed banks along the Salt River during bridge retrofitting) introducing sediment and contaminants (for example, a small amount of oil from the bridge deck concrete) into the water (for more information on construction activities related to the bridge retrofit see Section 3.17.3).

Additionally, as part of the Build Alternative, the Western Canal bridge would be widened from approximately 90 to 160 feet to accommodate the light rail and stations. The deck of the existing Western Canal bridge would be replaced, and the lanes would be reduced from two to one in each direction. Work over the canal could introduce sediments and construction debris into canal waters.

Expansion at the OMC would not affect the Grand Canal since all construction activities would be down slope of the canal. Design of the Build Alternative would adhere to drainage and other related requirements specified in Valley Metro's design criteria manual to minimize impacts on water quality.

The Build Alternative would result in greater than 1 acre of ground disturbance and would require a CWA Section 402(p) Arizona Pollutant Discharge Elimination System (AZPDES) general permit from ADEQ. Potential impacts to surface water at all the locations discussed would be prevented through the AZPDES permit and containment measures to prevent debris from entering surface waters. The main objectives of the permitting program are to reduce erosion, minimize sedimentation and eliminate the discharge of non-stormwater pollutants. The AZPDES permit requires developing a Stormwater Pollution Prevention Plan (SWPPP) and filing a Notice of Intent and Notice of Termination in accordance with the CWA. 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 Build Alternative 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. In addition, the City of Phoenix has a Stormwater Pollution Control Ordinance that prohibits most discharges (indirect and direct) into stormwater systems.

3.18.3.2 Groundwater

Indirect impacts to wells are not expected because the Build Alternative would not substantially modify the topography in the Build Alternative area or excavate below the groundwater table. It is not anticipated that groundwater would be encountered during construction of bridge piers and abutments.

During construction, stormwater would be managed in accordance with the Build Alternative's SWPPP to prevent contamination of the groundwater through stormwater infiltration.

As discussed in Section 3.17, the Build Alternative would require a CWA Section 404 permit for work in WOUS. In addition to the Section 404 permit, a CWA Section 401 water quality certification would be required for work in the Salt River bed.

3.18.4 Mitigation

This section describes mitigation measures as part of the proposed Build Alternative to avoid, reduce or mitigate adverse water quality impacts.

- The Contractor would be required to obtain an AZPDES permit prior to construction and to comply with the permit stipulations. The Contractor would file A Notice of Intent and Notice of Termination with ADEQ.
- The Contractor would be required to comply with the City of Phoenix's Stormwater Pollution Control Ordinance, which prohibits most discharges (indirect and direct) into stormwater systems.
- Prior to construction on the Central Avenue bridge (that is, over the Salt River) or Western Canal bridge, the Contractor would develop a containment system to prevent debris from entering the Salt River or the Western Canal during construction.
- Valley Metro would prepare and submit an application to ADEQ for a Section 401 Water Quality Certification
- To protect water quality, the Contractor shall comply with all terms and conditions of the Section 401 permit

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

3.19 ECOLOGICALLY SENSITIVE AREAS/THREATENED AND ENDANGERED SPECIES

For additional information on threatened and endangered species, refer to Appendix L, *Biological Assessment*.

3.19.1 Environmental Setting

The Build Alternative is 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. Given the Build Alternative area's high degree of urbanization, most naturally occurring desert scrub vegetation has been removed.

Most of the South Central Light Rail Extension study area is developed or disturbed and does not support ecologically sensitive habitats. In 2001, USACE signed an agreement with the City of Phoenix to complete the RSHRA—a 5-mile-long, 600-acre area along the Salt River riparian corridor within the banks of the Salt River and a 50-foot-wide corridor on each side between 19th Avenue and 28th Street. Its goal was to restore the native wetland and riparian habitats historically associated with the Salt River, which once flowed year-round through what is now Phoenix. In the early 1900s, the U.S. Bureau of Reclamation placed dams along the Salt River to create a series of reservoirs that would provide a reliable water supply for Phoenix and surrounding areas. This effort left behind a dry, barren riverbed that became lined with landfills, sand and gravel pits and industrial areas (City of Phoenix 2015c).

The RSHRA was completed and opened to the public in November 2005. Most of the native trees planted in the RSHRA were grown from seeds and cuttings gathered from within one-half mile of the river bottom. Cottonwood-willow forest habitat and mesquite bosques were historically abundant riparian ecosystem types along the banks of the Salt River and were replaced in conjunction with the restoration project. Other habitats restored included palo verde scrub, mixed salt bush/quail bush/burro brush and aquatic strand and wetland marsh within the low-flow channel and at select open-channel conveyance points throughout the restoration area. USFWS identified 24 migratory bird species that may use the newly restored areas. The area also provides habitat for nonmigratory bird species and small- to medium-sized mammals that benefit from the available water and cover. The City of Phoenix uses five wells throughout the RSHRA, with one in the study area, that pump water from a nonpotable aquifer below the study area into small reservoirs that directly feed wetlands and habitat in the riverbed. Twenty-two storm drains also flow into the riverbed to sustain the low-flow channel, vegetated habitats and wetland areas.

The OMC expansion area consists of barren gravel pads, existing trackwork and embankment slopes. Sparse shrub cover occurs across the northern and southern borders of the OMC. These shrubs offer limited cover or nesting opportunities and function similar to habitats within urban landscaping along roadsides and open space. The embankment slope extending across the northern border of the OMC parallels a human-made drainage swale and could support suitable habitat for ground burrowing owls protected under the Migratory Bird Treaty Act.

The Endangered Species Act of 1973, as amended, establishes a federal program to conserve, protect and restore threatened and endangered plants and animals and their habitats. Section 7 of the Endangered Species Act specifically charges federal agencies with the responsibility of using their authority to conserve threatened and endangered species. All federal agencies must ensure that any action they authorize, fund or carry out is not likely to jeopardize the continued existence of a threatened or endangered species or result in the destruction of critical habitat for these species.

A list of federally protected species and their critical habitat with the potential to occur within and adjacent to the South Central Light Rail Extension study area was obtained from the U.S. Fish and Wildlife Service (USFWS) and the Arizona Game and Fish Department (AGFD). The USFWS Information Planning and Conservation System and the AGFD Heritage Database Management System records of Endangered Species Act-listed species (that is, threatened, endangered, proposed or candidate species) for Maricopa County and were obtained for the Build Alternative. The USFWS Information Planning and Conservation System identified five endangered species (California least tern, southwestern willow flycatcher, Yuma clapper rail, lesser long-nosed bat and Sonoran pronghorn), one threatened species (yellow-billed cuckoo) and three candidate species (Sprague's pipit, roundtail chub and Sonoran desert tortoise) that should be evaluated for their potential to occur in the study area. AGFD's Heritage Database Management System identified that recovery areas for the Sonoran pronghorn and Mexican gray wolf occur within 3 miles of the Build Alternative. In addition, the bald eagle has been observed within the Build Alternative area. While the bald eagle is not a federally listed species, it is protected under the Bald and Golden Eagle Protection Act. No critical habitats for any species are within the study area.

The background information on species listed above was reviewed to evaluate the potential for these species and their habitat to be located in the study area. To assess and evaluate suitable habitat for listed species, a biologist conducted a field survey of the study area on September 28, 2015. Based on this assessment/evaluation, it was determined that the Build Alternative only contains or is near suitable habitat for the southwestern willow flycatcher, Yuma clapper rail, yellow-billed cuckoo and bald eagle; however, these species have not been documented within the study area.

Although the potential for future southwestern willow flycatcher habitat exists in the RSHRA, including the study area, the area does not contain appropriate vegetation densities large enough to support nesting flycatchers. However, it is possible that the southwestern willow flycatcher could use the RSHRA as a movement corridor or as migration habitat.

Habitat requirements for the Yuma clapper rail include marsh habitat with dense vegetation close to the water's edge, and open water with emergent wetlands does exist in the study area. This habitat is suitable for the Yuma clapper rail; however, the proximity to the bridge, traffic, recreational trails and surrounding urbanized areas reduces the habitat's overall quality.

The distance to suitable habitat for the yellow-billed cuckoo is over 9 miles from the study area and—although marginal suitable habitat exists near the study area where stands of larger, mature trees occur downstream—habitat within the study area does not contain the dense contiguous patches of multilayered riparian habitat in sufficient

acreage that the yellow-billed cuckoo requires. It is unlikely that the habitat in the study area would be utilized by the yellow-billed cuckoo because of the limited acreage of habitat, proximity to the bridge and urban developments and the secretive nature of the species; therefore, suitable yellow-billed cuckoo habitat does not exist within the study area.

Food availability for bald eagles is limited within and surrounding the study area, although foraging habitat is present within the Salt River channel when water flows occur from upstream. The absence of suitable trees for perching and the human recreational activity in the study area make the study area less desirable habitat for bald eagle foraging. The study area does not contain suitable foraging, perching, nesting or winter habitat for the bald eagle.

No habitat within the Build Alternative exists for the several threatened or candidate species, including the California least tern, lesser long-nosed bat, Sonoran pronghorn, Sprague's pipit, roundtail chub, Mexican gray wolf and Sonoran desert tortoise. Accordingly, these seven species are not being further analyzed for impacts.

3.19.2 No-Build Alternative

The No-Build Alternative would not affect ecologically sensitive areas or federally protected species.

3.19.3 Build Alternative

Constructing the Build Alternative would require upgrades to the existing Central Avenue bridge over the Salt River, resulting in temporary impacts to the RSHRA. The Build Alternative at the Salt River within the RSHRA contains suitable habitat for Endangered Species Act-listed species. Therefore, the Build Alternative would have an effect on endangered, threatened, proposed or candidate species and requires consultation with USFWS under Section 7 of the Endangered Species Act. The Build Alternative would require retrofitting the existing Central Avenue bridge structure over the Salt River to accommodate the light rail load:

- Remove and replace the center portion of the Central Avenue bridge deck and concrete girders. The retrofitted bridge would include the light rail guideway and one vehicular travel lane, one bicycle lane and a sidewalk in each direction.
- Excavate an area around each of the nine bridge piers so that the foundation of the bridge can be accessed. The base dimensions of the piers would not increase; instead each footing would be thickened vertically with additional concrete. For the two piers situated in open water, the work would occur well below the streambed and the area above it restored to preconstruction conditions. No permanent acreage loss of jurisdictional WOUS or wetlands would occur.
- Construct a temporary access road immediately adjacent (west side of the bridge) to the entire bridge and within the Salt River channel and the RSHRA. This temporary road would provide access to cranes and other construction vehicles to assist in the replacement of bridge girders and other structures. Construction of the temporary road would require fill in, and the subsequent restoration of, wetlands and WOUS created by the RSHRA.

- Temporarily remove the open water located at the two center piers by installing cofferdams or sandbags

All construction activities and ground disturbance (construction of the temporary access road, removal of the bridge deck, replacement of the four bridge girders and enhancement of the pier footers) within the Salt River channel would be temporary, lasting 10 months or less. Construction activities at the two piers within the wetland and open water areas where suitable habitat for the federally listed species occurs would last 6 months or less. Construction activities would start with the two piers in the wetlands and open water to minimize the duration of construction activities at this location. Flagging or staking would identify areas of construction avoidance to protect trees and avoid ground disturbance. Because of construction equipment operating dimensions and construction methods, trees would be removed. Where possible, trees would be considered for trimming rather than removal. Potential effects from these activities for each federally protected species are discussed below.

The expansion of the OMC would include construction of additional trackwork for train storage, expansion of the cleaning platform and expansion of the MOE building. The expansion would affect vacant land that is part of the OMC facility. The OMC facility does not contain any suitable habitat for any federally listed species. Therefore, no impacts are anticipated.

Areas within the OMC expansion area may provide suitable habitat for species protected under the Migratory Bird Treaty Act.

Southwestern Willow Flycatcher

The removal of riparian vegetation associated with the construction of the temporary access road could indirectly affect the southwestern willow flycatcher by reducing the amount of foraging or dispersal habitat. However, because the southwestern willow flycatcher is not known to breed within or near the Build Alternative area and because the affected wetland areas would be restored and replanted, there would be no adverse effects on the southwestern willow flycatcher.

In the unlikely event that flycatchers are migrating across the Build Alternative limits during construction, similar intact riparian habitats would still exist immediately upstream and downstream of the work area that could be used as foraging or dispersal habitat. In total, an approximately 150-foot linear strip of riparian corridor (perpendicular to the Salt River channel) under the Central Avenue bridge would be temporarily converted to gravel fill to support construction. Similar-sized and larger gaps of riparian vegetation are common along the Salt River as it flows through Phoenix.

Yellow-billed Cuckoo

The Build Alternative would have no effect on the yellow-billed cuckoo or its habitat because suitable yellow-billed cuckoo habitat does not exist within the study area, and it is unlikely that the habitat near the study area would be utilized by the yellow-billed cuckoo because of the limited acreage of habitat, proximity to the bridge and urban developments and the secretive nature of the species.

Yuma Clapper Rail

The Build Alternative would result in a temporary, direct loss of approximately 0.09 acre of emergent wetlands habitat, although the successional stage of wetland habitats within RSHRA is still early and many of the prey species favored by the rail have not been introduced or colonized into the area. Any construction disturbance in the RSHRA could cause any dispersing rails to avoid the Build Alternative area until construction is completed and suitable habitat develops. While small areas of potentially suitable Yuma clapper rail habitat exist within the RSHRA, the species has not been documented in the area; therefore, the proposed Build Alternative would not adversely affect the Yuma clapper rail.

Bald Eagle

The Bald and Golden Eagle Protection Act prohibits any form of possession or “take” of bald eagles—including any part, nest or egg—unless allowed by permit. The Act defines “take” as “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb.” The proposed Build Alternative would not result in a take of bald eagles because it would not eliminate foraging or nesting habitat.

Migratory Birds

Ground-disturbing construction and tree removal activities (within an approximately 2,870 square foot area) may overlap with the migratory bird nesting season, which generally extends from February 1 to August 30 of any given year. Within the study area, approximately 40 trees would be removed that are potentially utilized by migratory birds. USFWS identified 24 bird species protected under the Migratory Bird Treaty Act that may occur in the study area. Some displacement of these species and their nests could occur because of the temporary loss of habitat and increased activity in the RSHRA during construction. To minimize potential impacts to birds protected under the Migratory Bird Treaty Act, the Contractor may seek to schedule construction activities outside of the bird nesting season, conduct nests surveys prior to construction, remove empty nests prior to the nesting season, install nest deterrent devices or remove active nests or nestlings. Permits to remove active nests or nestlings, as necessary, would be acquired from the USFWS Migratory Bird Permit Office in Albuquerque, New Mexico.

3.19.3.1 Section 7 Consultation with U.S. Fish and Wildlife Service

A biological assessment (BA) (Appendix L) was prepared to fully assess and evaluate the potential effects of the Build Alternative to the species listed below. The species evaluated in the BA were determined by a qualified biologist in coordination with USFWS. The BA was submitted to USFWS for Section 7 consultation under the Endangered Species Act on March 3, 2016]. The BA concluded that the Build Alternative may affect, but is not likely to adversely affect, the southwestern willow flycatcher and Yuma clapper rail and would result in a no effect on the yellow-billed cuckoo. The BA also concluded that the Build Alternative would not result in a “take” of the bald eagle under the Bald and Golden Eagle Protection Act (Table 3-43). On April 14, 2016, the USFWS concurred with these findings (see Appendix L1 for the USFWS concurrence letter).

**TABLE 3-43: FEDERALLY LISTED OR PROTECTED SPECIES
WITH POTENTIAL TO OCCUR IN THE STUDY AREA**

Common Name <i>Scientific Name</i>	Status	Summary
Southwestern willow flycatcher <i>Empidonax traillii extimus</i>	Endangered	The proposed Build Alternative may affect, but is not likely to adversely affect, the southwestern willow flycatcher.
Yellow-billed cuckoo <i>Coccyzus americanus occidentalis</i>	Threatened	The proposed Build Alternative will have no effect on the yellow-billed cuckoo or its habitat.
Yuma clapper rail <i>Rallus longirostris yumanensis</i>	Endangered	The proposed Build Alternative may affect, but is not likely to adversely affect, the Yuma clapper rail.
Bald eagle <i>Haliaeetus leucocephalus</i>	Protected under the Bald and Golden Eagle Protection Act	The proposed Build Alternative will not result in a “take” and will not affect bald eagles.

3.19.4 Mitigation

The following mitigation measures would be implemented to minimize Build Alternative-related effects on the southwestern willow flycatcher, Yuma clapper rail, bald eagle and species protected under the Migratory Bird Treaty Act.

- The Contractor would minimize construction activity disturbance to riparian vegetation by avoiding vegetation to the extent possible and by trimming trees rather than removing them, if practicable, without severely reducing the survivability of the tree.
- Valley Metro would clearly define the limits of the work area in wetlands and the Salt River low-flow channel (for example, by staking or flagging) prior to ground-disturbing activities. The Build Alternative would avoid all flagged and/or otherwise designated sensitive resource areas within or adjacent to the project area.
- The Contractor would not conduct any clearing, grubbing or tree/limb removal from March 1 to August 31 (breeding season) unless a wildlife biologist has conducted a bird nest search of the affected vegetation and has determined that no active bird nests are present. Vegetation removal may occur if the area has been surveyed within 5 days prior to removal as long as only inactive bird nests, if any, are present. During the nonbreeding season (September 1 to February 28), vegetation removal is not subject to this restriction.
- The Contractor would stage and store materials and other work areas in uplands or previously disturbed areas to the extent possible.
- The Contractor would keep equipment inside the identified Build Alternative limits; equipment will not be stored, maintained or repaired within the RSHRA.

- Valley Metro, in coordination with the City of Phoenix, would develop a vegetation planting and habitat improvement plan incorporating plant species used for the RSHRA to replace vegetation removed within the Salt River channel.
- The Contractor would develop and implement a Stormwater Control Plan that includes a Spill Prevention and Containment Measures Plan (staging areas, nonpoint source spills containment and clean up, concrete washout, etc.) for working within and adjacent to the Salt River channel.
- Valley Metro would arrange for a wildlife biologist to perform a preconstruction survey within the RSHRA or OMC expansion area if construction occurs during the breeding season for migratory birds.
- The Contractor would restore the Salt River Channel, water flow and circulation patterns to preconstruction conditions following construction.

3.20 CONSTRUCTION

3.20.1 Environmental Setting

Construction activities would occur within the urban setting of the city of Phoenix. All work would conform to 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 last for approximately four years. The most disruptive construction activities would be related to installation of underground elements in the roadway.

3.20.2 No-Build Alternative

The No-Build Alternative would not include any construction-related activities because it only includes improvements to the transportation network that have already been approved and funded (see Section 2.2.1 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.

3.20.3 Build Alternative

The activities, anticipated impacts, and timing associated with construction of the Build Alternative are discussed below.

3.20.3.1 Construction Activities

Construction of the Build Alternative would require the installation of new infrastructure elements including concrete track slab or ballasted material in the roadway along the Build Alternative alignment, special trackwork, LRT stations, catenary poles and wires, conduit for TPSSs and communications and signaling systems near the LRT tracks. Buildings for TPSSs and cabinets for signal equipment would be installed along the Build Alternative corridor. Two roundabouts would be constructed; one at Central Avenue/Victory Street and one near the Audubon Center. Additionally, two park-and-

rides, one at Ed Pastor Transit Center and another just north of the Western Canal would be constructed as part of the Build Alternative.

Temporary impacts are anticipated at various times throughout the construction process, and 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. 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 activities are described in Table 3-44.

TABLE 3-44: BUILD ALTERNATIVE CONSTRUCTION ACTIVITIES

Step	Activities/Comments
Construction preparation	Would include the removal of landscaping and fencing and relocation of signs and other surface features.
Street widening	Street widening would be needed at certain locations to accommodate light rail stations and additional traffic lanes. This would primarily occur at the five flared intersections in the corridor—Buckeye Road, Interstate 17, Broadway Road, Southern Avenue and Baseline Road—where streets would be widened to accommodate one to two through lanes, a shared lane for bicycles and right turns and a dedicated left-turn lane in each direction. Street widening would also occur at the 7th Ave and Interstate 17 intersection where northbound and southbound right-turn lanes would be added.
Utility relocation	Relocations of underground utilities such as fiber optic cable, sewer storm drains, water lines, irrigation and electrical cabinets and conduits.
Trackwork, underground systems work, and station platforms	Would include installation of drainage structures, conduit and vaults for both traction power and signal and communication systems, concrete slabs for track and platforms and OCS pole and traffic signal pole foundations. The track guideway and street pavement would then be finalized.
Traction power and OCS system	Light rail transit OCS poles would be placed in or adjacent to the guideway along the extent of the Build Alternative corridor to hold the OCS system that supplies power to the trains. Installation of TPSSs and cabinets for signal equipment.
Traffic signal improvements	Installation of traffic signal improvements including poles and equipment.
Park-and-ride facilities	Site preparation work, paving, striping, and landscaping for parking facilities.

Notes: OCS = overhead catenary system, TPSS = traction power substation

3.20.3.2 Construction Impacts

Although construction of the Build Alternative would provide short-term employment opportunities, it would result in temporary disruptions to businesses, residences and those traveling through the study area. Valley Metro intends to minimize the duration of any street closure or suspension of utility service, and a communication plan would be in place to notify businesses and residents of the temporary suspension of utility service.

The temporary construction impacts associated with the McKinley Loop, OMC and traffic mitigation on 7th Street and 7th Avenue, as well as the mitigation that would be implemented, would be similar to those discussed throughout this section.

Typical construction impacts are discussed below, and mitigation measures proposed to reduce these impacts are described in Table 3-48.

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, stations, street reconstruction, TPSSs, communications and signaling. Temporary interruptions in service (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 Phoenix to inform businesses and residents of any service disruptions and provide a timeframe for the approximate beginning and end 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 light rail route. It is possible that temporary closures of traffic lanes, sidewalks or bicycle lanes because of utility relocations or the movements of haul trucks and other construction vehicles may result in temporary delays. A traffic control plan would be developed with the City of Phoenix 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.

Transit services operating along the Build Alternative corridor and all cross streets would be maintained during construction (see Table 2-4 for the list of transit services that may potentially be affected). During development of the Build Alternative, Valley Metro and its design staff would coordinate transit operations for any temporary reroutes and bus stop relocations that may be required during construction. Similarly, Valley Metro would implement measures to maintain light rail service and connectivity to transit services at four locations on the existing Central Phoenix/East Valley Line. This would include temporarily removing each light rail transit track from service for a short period (most likely over weekends and/or nights) and implementing a bus bridge to provide service between affected light rail stations. Signs and announcements of temporary station closures would be publicized, and both Valley Metro and the City of Phoenix would work with area stakeholders to notify them of any disruptions to light rail service.

Noise and Vibration

The use of heavy equipment during construction has the potential to result in substantial, yet temporary, increases in local noise levels along the corridor. The FTA Guidance Manual recommends using local construction noise limits, if possible. For the City of Phoenix, the municipal code is interpreted as having no specific noise limits that

apply. As a result, the construction noise for the Build Alternative should be examined in terms of the FTA guidance (shown in Table 3-45) for evaluating the potential community response to construction noise. The guidelines are based on an average Leq over a typical 8-hour workday. The FTA recommended limit of 80 dBA for the daytime Leq has been used in this assessment as the threshold for impact for residential areas.

TABLE 3-45: CONSTRUCTION NOISE GUIDELINES

Land Use	Noise Limit, 8-hour Leq (dBA)	
	Daytime	Nighttime
Residential	80	70
Commercial	85	85
Industrial	90	90

Source: Federal Transit Administration (2006)

Notes: dBA = A-weighted decibel, Leq = hourly equivalent sound level

Construction noise levels depend on the number of pieces and type of equipment, their general condition, the amount of time each piece operates per day, the presence or lack of noise-attenuating features such as walls and berms and the location of the construction activities relative to the sensitive receivers. Most of these variables are left to the discretion of the construction Contractor selected by Valley Metro as the Build Alternative approaches the construction phase. Therefore, it is not possible to accurately estimate construction noise levels at this conceptual design stage.

For a rough estimate of construction noise, the following describes a typical construction scenario. The construction of light rail track requires use of heavy earth-moving equipment, pneumatic tools, generators, concrete pumps and similar equipment. Table 3-46 shows the equipment likely to be used during the noisiest periods of track construction, the typical noise generated by this equipment, the usage factors and the estimated work-shift Leq. The combined work-shift Leq for the construction scenario shown in Table 3-46 is 84 dBA at a distance of 50 feet. Given that some residences along the corridor are within 50 feet of the alignment, it is clear that there is a high probability that the Contractor would exceed the impact threshold of 80 dBA for the work-shift Leq. For additional information about residences within 50 feet, refer to Table 3-20 in Section 3.8 for addresses and specific distances of homes from the alignment and Figures 3-6 through 3-9 for their locations along the alignment. Nighttime construction in noise-sensitive areas would be avoided. This analysis shows that impacts are likely unless the Contractor is required to implement noise control measures when working near residences. For additional information, refer to Appendix E, *Noise and Vibration Technical Report*.

The primary concern regarding construction vibration is potential damage to structures. The thresholds for potential damage are much higher than the thresholds for evaluating potential annoyance used to assess impact from operational vibration. At a distance of 50 feet from buildings, the predicted vibration levels from construction are below the damage risk criteria for even those buildings most sensitive to damage. For additional information, refer to the Construction Vibration section of Appendix E, *Noise and Vibration Technical Report*.

TABLE 3-46: PREDICTED CONSTRUCTION NOISE AT 50 FEET

Equipment	Sound Level at 50 feet Under Load (dBA)	Source Usage Factor (% Time Under Full Load)	Leq (8-hour Work Shift) (dBA)
Earthmover (bulldozer, front-end loader, etc.)	82	40	78
Mobile crane	81	20	74
Dump truck	76	40	72
Pneumatic tools	85	30	80
Generator	78	40	74
Compressor	81	40	77
Total			84

Notes: dBA = A-weighted decibel, Leq = hourly equivalent sound level

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. CO and PM₁₀ hot-spot analyses are not required to consider temporary, construction-related emissions under the transportation conformity rule. Temporary increases are those that occur only during the construction phase of a project and last 5 years or less at any individual site. Because construction of the Build Alternative would take less than 5 years, the construction-related activities are considered temporary. Although adverse impacts are possible, they would be short term and would end upon construction completion. The long-term benefit of a convenient and reliable alternative transportation source would offset the short-term adverse impacts. Contractors would be responsible for managing the construction in conformance with all applicable local and regional air quality regulations to avoid sensitive receptors in the study area such as daycare centers, senior housing and hospitals. A dust control plan would be developed and implemented in accordance with 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 104.1.3), Valley Metro's master specifications for dust control, applicable City of Phoenix 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. All trucks hauling or transporting construction materials or debris would require coverings to reduce the potential for materials to become airborne. For additional information, refer to Appendix D, *Air Quality Technical Report*.

Water Quality

Potential water quality impacts would be confined to those associated with the transport of sediment-laden runoff from excavation activities, or accidental spills (that is, fuel, lubricants), 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. In the desert, soils are generally dry and have poor absorption. During heavy rainfall, this can result in runoff of sediment and possibly contaminants (for example, motor oil, gasoline). Note that the Salt River bed is normally dry and has been graded in the vicinity of two of the bridge piers to deliberately hold water. When the pier foundations are improved as part of the Build Alternative, modifications (for example, reducing the held-water-level, regrading near piers, shoring or using a coffer dam) would be made to enable construction. Water could potentially enter the excavation through precipitation or infiltration. In either case, appropriate measures would be similar and included in the contractor's SWPPP. Water that is removed in and around the two piers would be pumped downstream of the site within the RSHRA.

To mitigate potential adverse water quality impacts along the Build Alternative construction site, contractors and construction activity would be required to adhere to the provisions of the CWA 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 1 acre. The Build Alternative would also conform to the City of Phoenix's Stormwater Management Plan.

3.20.3.3 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. Construction is generally forecast to occur between 2020 and 2023 with a total duration of 4 years. As the Build Alternative advances to later stages of engineering and design and a construction method is determined, a more refined construction schedule would be developed and coordinated with the City of Phoenix and stakeholders. Several options, summarized in Table 3-47, are being considered to minimize the Build Alternative construction period. The impacts would not change if the construction period were compressed; only the duration of the construction itself would be modified. The specific options and timing for construction would be determined during final design.

TABLE 3-47: OPTIONS TO MINIMIZE CONSTRUCTION DURATION

Option	Details
Allow construction to occur 24 hours per day	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. Nighttime construction would require approval by the City of Phoenix.
Use additional construction crews or allow use of overtime	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 utility structure relocations	Preliminary estimates of utility relocations would be completed as part of the advanced conceptual engineering effort associated with the Environmental Assessment. Final determination of relocations and coordination with utility companies would take place during final design.
Design to decrease construction time	Several design features could be implemented to reduce construction time. Examples include: • Replace existing manholes with offset manholes where necessary and reduce the total number of manholes to the extent possible. • Leave abandoned utilities in place in lieu of removal. • Close entire intersection where construction is occurring for a short duration to remove and install roadway and trackway.

3.20.4 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 3-48. Additional information may be found in the construction impacts sections of technical reports and memoranda in the appendices of this EA. The project would result in short-term disruption impacts on local businesses and residents surrounding the construction. Short-term impacts are 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 would be implemented. As with any construction project, the adverse impacts would end upon construction completion. The long-term benefits of a convenient and reliable transportation alternative to the automobile would offset the temporary construction impacts.

TABLE 3-48: CONSTRUCTION-RELATED IMPACTS/MITIGATION MEASURES

Mitigation Measures by Type of Potential Impact
<i>Community Disruption/Economic Activity</i>
Strategies to minimize temporary disruptions include: • Valley Metro, its Contractor(s) and the City of Phoenix would work together to create 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. • Valley Metro would implement programs similar to those developed for the Central Mesa Extension and Northwest Phase I Light Rail Extension projects that included extensive business outreach programs; a Community Advisory Board to evaluate construction Contractors and construction outreach support to help resolve construction-related issues such as temporary roadway, driveway and sidewalk closures. • 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 Phoenix. 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: - 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 Phoenix 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.
<i>Utilities</i>
The Contractor would adhere to Valley Metro and the City of Phoenix standard requirements for utility work that includes but may not be limited to: • 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.
<i>Debris and Soil</i>
• The Contractor would transport debris and soil generated by construction to approved disposal sites and would obtain the necessary state and local permits.

Mitigation Measures by Type of Potential Impact

Transportation (Traffic, Pedestrians and Bicycles)

Valley Metro will develop a traffic control plan that would include measures in accordance with City of Phoenix, Valley Metro master specifications and MAG standards such as:

- Maintain transit operations in each direction along the Build Alternative corridor and all cross streets. During Build Alternative development, Valley Metro and its design staff would coordinate transit operations for any temporary reroutes and bus stop relocations that may be required during construction.
- Impacts to residential and business access including temporary closures of roads, driveways, sidewalks and bicycle lanes would occur. Community outreach notification and access management planning would be required during the Build Alternative development phases and during construction to minimize impacts.
- Impacts to public services, such as garbage, utility and emergency services, may occur during construction. Alternative schedules and routing options would be identified in the traffic control plan that would conform to local, state and federal policies.

Coordinate with the appropriate Contractor, city agency and public during the Build Alternative development phases to develop an access management plan.

- Temporary closures of sidewalks and crosswalks are possible. Detours would be established to safely guide pedestrians until the sidewalks and crosswalks are restored in accordance with Americans with Disabilities Act 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 how construction could affect them.

Valley Metro would implement measures to maintain light rail service and connectivity to transit services at four locations on the existing Central Phoenix/East Valley Line, to include the following:

- Temporarily remove each light rail transit track from service for a short period (most likely over weekends and/or nights) and implement a bus bridge to provide service between affected light rail stations.

Noise

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

- Avoid nighttime construction where residents are within 50 feet of nearest track.
- If nighttime construction is required, the Contractor would apply for a variance permit from the City of Phoenix as required by the 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 the 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 the 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 Arizona Pollutant Discharge Elimination System permit and the City of Phoenix's Stormwater Management Plan require developing and implementing 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.

Mitigation Measures by Type of Potential Impact

Vibration

- 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.

3.21 CUMULATIVE IMPACTS

3.21.1 Environmental Setting

Cumulative impacts are described as potential impacts that could 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. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. A list of developments approved or likely to take place in the near future is provided in Table 3-49. Figure 3-28 provides a map of the projects.

Transportation projects with the potential to result in cumulative impacts are planned Valley Metro transit facilities by 2035 (listed in Table 2-6) that include the Capitol/I-10 Light Rail Extension scheduled to begin operations in 2023 and the planned joint development at the existing Central Station Transit Center, which does not yet have scheduled construction and completion dates. Roadway projects scheduled to be constructed and in operation by 2035 proximate to the South Central Light Rail Extension study area are listed in Table 2-5 and are included in the MAG TIP, Fiscal Year 2014–2018 (MAG 2014b). These projects are being undertaken to improve long-term transportation service and to provide for sustainable future development in Phoenix and the greater metropolitan area. Resource areas with the potential for cumulative impacts are analyzed in Table 3-50.

3.21.2 No-Build Alternative

The No-Build Alternative represents conditions in 2035 if the Build Alternative were not built and is defined as the existing transit and roadway/highway system plus programmed (committed) transportation improvement projects, as discussed in Section 2.2.1 and in Section 3.21.1.

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 area's transit network would remain largely the same. Therefore, the No-Build Alternative would not contribute to cumulative effects for this proposed action.

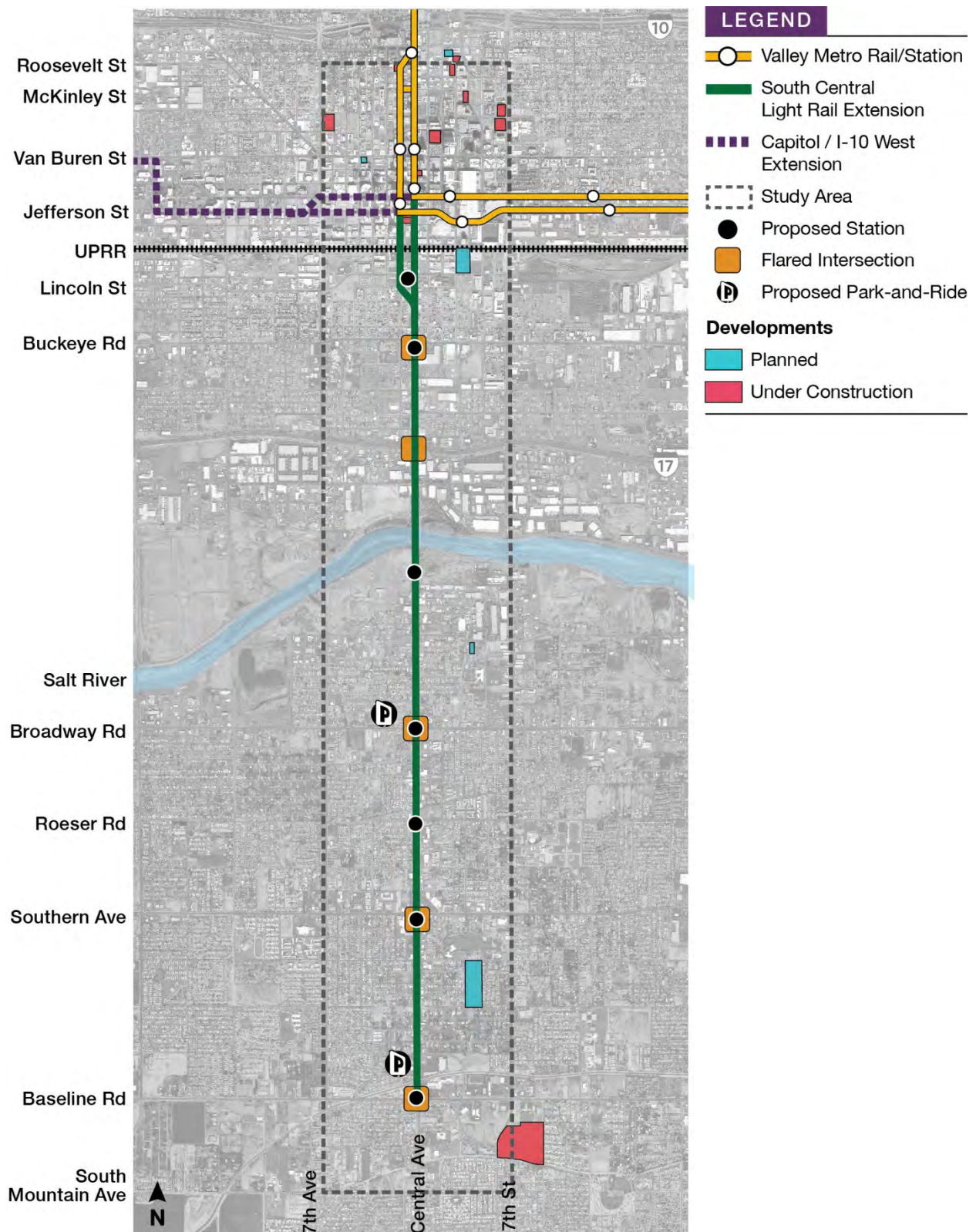
TABLE 3-49: CURRENT AND FUTURE DEVELOPMENT PROJECTS

Project	Address/ Cross Streets	Uses	Status	Anticipated Completion
Alta Fillmore	7th Ave and Fillmore St	Multifamily residential	Construction underway	2016
Arizona Cancer Center	625 N 5th St	Education	Construction underway	2015
Arizona Center for Law and Society	111 Taylor St	Education	Construction underway	2016
Hotel Monroe	Central Ave and Monroe St	Hotel	Construction underway	2016
Illuminate	3rd St and Roosevelt St	Mixed-use; multifamily residential/retail	Construction underway	2016
Linear	3rd St and Roosevelt St	Mixed-use; multifamily residential/retail	Construction underway	2016
Luhrs City Center Marriott	11 W Jefferson St	Mixed-use: residential/commercial/hotel	Construction underway	2016
Luhrs Tower Renovations	11 W Jefferson St	Office	Construction underway	2016
Proxy 333	4th St and Fillmore St	Mixed-use; multifamily residential/office	Construction underway	TBD
Union at Roosevelt	4th St and Fillmore St	Mixed-use; multifamily residential/retail	Construction underway	2016
University of Arizona Biosciences Partnership Building	7th St and Fillmore St	Education	Construction underway	2016
Villages at Verona	7th St and Jesse Owens Pkwy	Single-family residential	Construction underway	TBD
Alta Vista	327 E Alta Vista Rd	Single-family residential	Planned	TBD
Ballpark Apartments	301 E Buchanan St	Mixed-use; multifamily residential/retail/office	Planned	TBD
Elwood Warehouse	315 E Elwood St	Warehouse	Planned	TBD
Encore on Second	1015 N 2nd St	Multifamily residential	Planned	TBD
Historic Welnick Marketplace	345 W Van Buren St	Commercial	Planned	2016

Source: City of Phoenix (2015a)

Note: TBD = to be determined

FIGURE 3-28: CURRENT AND FUTURE DEVELOPMENT PROJECTS



3.21.3 Build Alternative

Cumulative impacts are analyzed in terms of the specific resource being affected, focusing on those impacts that are regarded as plausible in association with the Build Alternative. Table 3-50 presents the analysis of the proposed Build Alternative with regard to cumulative impacts.

TABLE 3-50: CUMULATIVE IMPACTS ANALYSIS

Potential Impacts	Project's Contribution to Cumulative Impacts	Findings
Land use/ Economic development	Beneficial	The Build Alternative would integrate communities in 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 in the study area. The City of Phoenix's 2015 General Plan states a renewed emphasis on creating a "system of streets which encourage and facilitate active transportation, support investment in transit, foster social engagement and community pride, improves safety for all transportation modes, supports the local economy and property values, and improve the livability and long-term sustainability of our region." The City has also adopted plans and ordinances, such as the Transit Oriented Development and the Infill Development Overlay Districts, 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 in 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 other areas of the region. Development would be compatible with local land use plans; therefore, the Build Alternative is not expected to result in an adverse effect or contribute to a cumulative adverse effect. .
Traffic	No effect	Potential impacts to traffic are discussed in Section 3.6. While the Build Alternative would affect traffic at some intersections, mitigation measures have been identified to ensure that these intersections operate at an acceptable level of service. As Downtown Phoenix 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 not result in an adverse effect or contribute to a cumulative adverse effect related to traffic.

Potential Impacts	Project's Contribution to Cumulative Impacts	Findings
Air quality	No effect	The Build Alternative's air quality analysis showed no adverse impacts. It was based on MAG's RTP update, which 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 result in an adverse effect or contribute to a cumulative adverse effect. If future federally funded projects such as light rail 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	No effect	Planned and approved projects, including the Build Alternative, have the 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 greater 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 result in an adverse effect or contribute to a cumulative adverse effect. .
Energy	No effect	As previously discussed in Section 3.9, the Build Alternative is anticipated to reduce energy needs among passenger vehicles and transit bus vehicles, but increase the energy needs of rail transit modes; therefore, it would result in no beneficial or negative energy impacts.

Notes: MAG = Maricopa Association of Governments, RTP = *Regional Transportation Plan*

3.21.4 Mitigation

In summary, the Build Alternative is primarily 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 result in an adverse effect or contribute to a cumulative adverse effect. Mitigation measures directly related to cumulative impacts are presented below:

- If several projects are being constructed concurrently with the Build Alternative, Valley Metro would coordinate closely with the City of Phoenix, ADOT or other project sponsors to coordinate construction efforts and appropriate short-term mitigation measures, such as enhanced signs for business and traffic control during construction to minimize significant disruptions.
- The construction Contractor would be required to obtain an AZPDES permit prior to construction and to comply with the stipulations of the permit. 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 construction Contractor would be required to comply with the City of Phoenix Stormwater Management Plan.
- 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 South Central Light Rail Extension Project since its inception in 2012. A comprehensive Public Involvement Plan was developed and implemented to coordinate with—and obtain input from—public agencies, private interests, community and faith-based organizations and the public at large for the development of alternatives, selection of the Build Alternative and completion of the environmental analysis. Public involvement would continue during design and construction of the Build Alternative. This chapter summarizes the coordination and community outreach activities and approaches conducted to date. Table 4-1 presents the objectives of the outreach program.

TABLE 4-1: OBJECTIVES OF THE PUBLIC INVOLVEMENT PLAN

Major Objectives
• Obtain broad and continuous public participation and involvement throughout the study. • Ensure that the process is open and fair. • Ensure that community concerns are incorporated into project planning. • Comply with Federal Transit Administration, National Environmental Policy Act and Section 106 of the National Historic Preservation Act requirements for public participation. • Develop and continue a program for public participation and community involvement in subsequent phases of the study.

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 development of the EA. Prior to the first set of public meetings, hosted in the spring of 2012, staff met with several nonprofit and community-based organizations to introduce the purpose of the study and to receive community feedback. The first set of public meetings to introduce the South Central AA was hosted in March 2012. Most recently, a public scoping meeting for this EA was held on February 4, 2015, initiating this environmental review process for the Build Alternative.

Community outreach activities would 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 Phoenix board and committee meetings
- Phoenix City Council meetings
- Community stakeholder meetings

A summary of meetings held with local, State and federal agencies and their 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 2012.</u> Weekly meetings with South Central Extension Project team members. The meetings provided an opportunity for staff to inform the team about study developments/tasks, including community and stakeholder interests.
Agency Environmental Assessment scoping meeting	<u>Feb 5, 2015.</u> More than 14 federal, State and local government agencies were afforded the opportunity to identify important issues and bring fresh ideas for solutions to the table. Valley Metro, City of Phoenix, Maricopa County, U.S. Federal Courthouse staff and Union Pacific Railroad were represented at the meeting.
City of Phoenix department presentations/briefings	<u>Ongoing since 2012.</u> Occurred during scoping, Alternatives Analysis Tier 1, Alternatives Analysis Tier 2 and selection of recommended Build Alternative for Environmental Assessment evaluation. <u>Departments briefed include:</u> City Manager's Office, Streets, Community and Economic Development, Convention Center, Planning and Development, Finance, Real Estate, Police and Public Transit departments.
State Historic Preservation Office (SHPO)/City Historic Preservation Office (CHPO)	<u>Ongoing since 2012.</u> Valley Metro is a joint lead with the Federal Transit Administration coordinating Section 106 of the National Historic Preservation Act. Valley Metro is coordinating with both SHPO and CHPO on the area of potential effects, identification of eligible resources, evaluation of effects on resources and appropriate treatments for historic properties.
Consultation/coordination with other agencies	<u>Ongoing since 2012.</u> Items for which input was sought include: existing environmental conditions, quality of resources that may 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> U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, Arizona Department of Transportation, Federal Highway Administration, Arizona Department of Administration, U.S. General Services Administration, Maricopa County Facilities Management, Ak-Chin Indian Community, Fort McDowell-Yavapai Nation, Gila River Indian Community, Hopi Tribe, Pascua Yaqui Tribe, Salt River Pima-Maricopa Indian Community, San Carlos Apache Tribe, Tohono O'odham Nation, Tonto Apache Tribe, White Mountain Apache Tribe, Yavapai-Apache Tribe, Yavapai-Prescott Indian Tribe, Bureau of Reclamation and Salt River Project.

4.3 COMMUNITY OUTREACH BY STUDY PHASE

Valley Metro and the City of Phoenix 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 Phoenix. Public outreach played an important role in the decision-making process. Following completion of the AA phase, the study 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.

Sixteen public meetings were held since June 2012, including six CWG meetings and the EA public scoping meeting. The meetings were intended to encourage public participation and agency involvement throughout the decision-making process. They were designed to inform the public, interested stakeholders and government agencies about the proposed light rail extension.

4.3.1 Alternatives Analysis Outreach Activities

The AA phase 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 was narrowed, and the highest-performing alternatives were selected for more detailed evaluation during Tier 2.

A range of public and agency engagement activities were conducted during the Tier 1 study phase. Outreach to individual businesses, residents, elected officials and other stakeholders was coupled with direct communication efforts to community groups, government agencies, churches, schools and neighborhood/homeowners' groups. Two public meetings were held in June 2012 to inform the public of the study area for the South Central Extension AA and to review the three transit modes and 11 route options under consideration. During public meetings, members of the study team reviewed the purpose and need of the project, explained 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 and provide comments.

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 featured a multifaceted approach and began well in advance of the Tier 2 public meetings. The overreaching goals of the Tier 2 public outreach effort were to reengage the public, present study findings and recommended alternatives and provide a forum for public input. Two public meetings were held in October 2012 to share with the public that—based on additional technical analysis and public comments—the initial 11 route options had been narrowed to 6 route options: BRT on Central Avenue/1st Avenue, LRT or modern streetcar on Central Avenue/1st Avenue and LRT, BRT, or modern streetcar on Central Avenue/Buckeye Road/7th Avenue. Public outreach efforts also included communication with key businesses, residents, government officials, other stakeholders, community groups, government agencies, churches, schools and neighborhood/homeowners' groups and outreach to local and regional media outlets. As always, Spanish translation and Americans with Disabilities Act-accessible facilities were available at each public meeting. In addition, informational materials in alternative formats were available for those who requested them.

During the Tier 2 public meetings, members of the study team presented the study process and provided information on the AA results; evaluation criteria used; detailed findings regarding operational frequency and capacity, daily ridership and capital costs; impacts on historical 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 and provide comments. The public was also able to submit comments following the public meetings through the website, email, mail or telephone.

In addition to public meetings, Valley Metro held two meetings in November 2013 for business stakeholders in the study corridor to review the proposed alignment and to provide feedback specific to the business community regarding the proposed light rail

extension. In October 2014, a public open house and two business stakeholder open houses were hosted to share study information, including proposed station locations, lane configurations and next steps.

Table 4-3 summarizes the public meetings held during the study's AA phase.

TABLE 4-3: GENERAL PUBLIC MEETINGS

Public Meeting	Additional Information
Tier 1 (initial screening)	Jun 5, 2012; 13 attended Jun 7, 2012; 18 attended
Tier 2 (refined screening)	Oct 18, 2012; 13 attended Oct 23, 2012; 19 attended
Business outreach	Jan 24, 2013; 29 attended
Tier 2 results	Mar 6, 2013; 24 attended Mar 7, 2013; 11 attended
Community Working Group	Apr 17, 2013; 10 attended May 15, 2013; 10 attended Jun 19, 2013; 10 attended Jul 17, 2013; 10 attended Aug 21, 2013; 10 attended Sep 18, 2013; 10 attended
Recommended Alternative	Oct 15, 2013; 35 attended Oct 24, 2013; 16 attended
Business outreach	Nov 20, 2013 (two meetings: afternoon and evening); 10 attended
Build Alternative	Oct 22, 2014; 40 attended
Business outreach (Build Alternative)	Oct 23, 2014 (two meetings: morning and evening); 27 attended
Public and Agency Environmental Assessment scoping	Feb 4, 2015; 68 attended

4.3.2 Community Working Group

Prior to finalizing the Build Alternative, a 15-member CWG was established with representatives from the business community, the faith-based community, nonprofits, the education community and homeowners. The CWG met six times (Table 4-4) to review and make recommendations on topics such as roadway configurations, station locations and economic development. After 6 months of working with the CWG and additional technical analysis, the Build Alternative with five proposed station locations was presented at two public meetings in October 2013. Analysis of two additional station locations (Watkins Street or Audubon Center and Roeser Road) and street configurations for the South Central Light Rail Extension continued. A summary of the CWG meeting dates and information discussed is presented in Table 4-4.

TABLE 4-4: COMMUNITY WORKING GROUP MEETINGS

Date	Topics Discussed
Apr 17, 2013	Roadway configurations (traffic lanes, bike lanes, landscaping, sidewalks)
May 15, 2013	Station locations
Jun 19, 2015	Park-and-ride location
Jul 17, 2013	Economic development
Aug 21, 2013	Land use
Sep 18, 2013	Destination connections (South Mountain Park/Preserve)

4.3.3 EA Scoping and Outreach Activities

The work of the CWG, City of Phoenix staff and Council and members of the public helped the study advance to the environmental phase, the EA. In February 2015, Valley Metro and the City of Phoenix held separate public and agency scoping meetings to begin the EA process for the South Central Light Rail Extension Project. This meeting was designed to inform the public, interest groups and government agencies about the proposed Build Alternative and the alternatives considered and to seek input on concerns the public had regarding potential environmental impacts, especially on cultural resources, with implementation of the Build Alternative. The primary goals of scoping were to encourage the 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 study team. A listing of the agency scoping meetings is in Table 4-2.

Public notification of the scoping process, as well as for the AA, was widely publicized through:

- Individual outreach to key business stakeholders, residents, government officials and other stakeholders
- Group outreach to community groups, government agencies, chambers of commerce, churches, schools and neighborhood/homeowner groups
- Media outreach through press releases and paid advertisements in local print media, including the *Arizona Republic* and the Spanish-language publication *La Voz*
- Information posted on the City of Phoenix and Valley Metro websites, with study and public meeting details
- Bilingual door hanger meeting notices distributed to stakeholders within a quarter-mile of the study area

During the public scoping meetings, display boards were available for viewing and a formal presentation was given to provide information about the study. After the presentation, the audience was invited to ask questions. The public was also encouraged to submit comments through the website, email, mail or telephone. Spanish translation and Americans with Disabilities Act-accessible facilities were available for all public meetings. In addition, informational materials in alternative formats were made available upon request (for example, foreign languages, Braille scripts).

Approximately 300 residents, business owners and property owners attended the meetings during the early study phases and the EA scoping meeting. Those who attended engaged in meaningful discussion and provided valuable input regarding the alignment alternatives 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 through the Internet.

4.4 BOARDS/COMMITTEES/CITY COUNCIL

The Public Involvement Plan also included outreach to various committees, boards and councils (including the Phoenix City Council). This is summarized in Table 4-5.

TABLE 4-5: BOARD AND COMMITTEE MEETINGS

Board/Committee	Mission/Purpose	Meeting Dates
Central City Village Planning Committee	Local planning committee for Downtown Phoenix	Mar 12, 2012; Sep 10, 2012; Nov 4, 2013; Nov 10, 2014; Dec 14, 2015
City of Phoenix Citizens Transit Commission	Local review of transit plans and policies	Mar 8, 2012; Oct 4, 2012; May 2, 2013; Nov 7, 2013; Nov 6, 2014
City of Phoenix Historic Preservation Commission	Coordination and review of matters of historic preservation	To be determined
MAG Management Committee	Regional policy and planning	Nov 5, 2014
MAG Regional Council	Regional policy and planning	Aug 27, 2014; Dec 3, 2014
MAG Transit Committee	Regional transit policy and planning	Jul 12, 2012
MAG Transportation Policy Committee	Regional policy and planning	Oct 23, 2014; Nov 12, 2014
MAG Transportation Review Committee	Regional policy and planning	Oct 23, 2014
Phoenix Transportation and Infrastructure Subcommittee	City Council subcommittee	Nov 19, 2013
Maricopa County Board of Supervisors	Governing body for Maricopa County	Sep 25, 2014
Phoenix City Council	Governing body for City of Phoenix	May 28, 2013; Oct 15, 2013; Dec 10, 2013; Nov 12, 2014; Nov 18, 2014
South Mountain Village Planning Committee	Local planning committee for South Phoenix	Mar 13, 2012; Sep 11, 2012; Mar 12, 2013; Nov 12, 2013; Nov 12, 2014; Dec 18, 2015
Arizona State Transportation Board	Governing body for Arizona Department of Transportation	Sep 12, 2014
Valley Metro Regional Public Transportation Authority Board	Regional transit agency	Sep 18, 2014; Jan 1, 2015

Note: MAG = Maricopa Association of Governments

4.5 ADDITIONAL STAKEHOLDER MEETINGS

During the AA and into the EA process, the Valley Metro study team made contact with—and gauged the interests of—businesses, residents, community groups, neighborhood associations and transportation groups. In addition, Valley Metro staff attended many community and neighborhood meetings and events to inform stakeholders of the study and to receive feedback. Table 4-6 identifies stakeholder groups contacted throughout this process.

TABLE 4-6: ADDITIONAL STAKEHOLDER MEETINGS

Stakeholder/Event	Meeting Dates
ACE Auto Repair (Dick Sellars)	Aug 8, 2013
Arizona Hispanic Chamber of Commerce	Jul 1, 2013
Audubon Society	Jun 17, 2013
Broadway Community Outreach Group (BCOG)	Apr 11, 2013
Central City South/PRC Community Tour	Oct 25, 2012
Central City South Community Connection Fair	Mar 2, 2013; Mar 1, 2014
Chicanos Por La Causa	May 18, 2012; Jul 17, 2013
City Council District 8 African American Advisory Council	Jul 16, 2014
City Council District 8 Community Meeting	Aug 16, 2012
City of Phoenix South Central Business Advisory Committee	Mar 6, 2014; Dec 16, 2015
City of Phoenix Planning Department Place Type Stakeholder meetings	Nov 3, 2015; Nov 4, 2015
Congressman Ed Pastor	Apr 4, 2013
Councilman Michael Nowakowski	Sep 8, 2014
Councilwoman Laura Pastor	Jan 29, 2014
Del Rio Area Brownfields	Apr 24, 2012
Downtown Phoenix Inc.	Jun 28, 2013; Oct 21, 2014
Downtown Voices Coalition	Apr 14, 2012; May 12, 2012; Aug 11, 2012; Oct 13, 2012; Nov 10, 2013; Apr 13, 2013; Nov 9, 2013
Ferguson (Ben Rathke)	Apr 23, 2015; Jul 15, 2015
FHWA/Valley Metro/City of Phoenix AZ Pedestrian Assessment	Mar 4, 2015
Friendly House	May 14, 2012; Jul 16, 2013
Friendly House Market on the Move	Apr 27, 2013
GAIN Event	Oct 19, 2013
George Young (homeowner)	Oct 14, 2014; Nov 18, 2015
Grant Park Holiday Celebration	Dec 1, 2012; Dec 7, 2013
Grant Park Neighborhood Association	Jul 10, 2012
Hinkson Company (James Neal)	Apr 16, 2015
Hope VI/PRC Community Action Team (CAT) Meeting	Nov 8, 2012; Mar 14, 2013; Jul 11, 2013; Nov 14, 2013; Mar 12, 2015

Stakeholder/Event	Meeting Dates
Industrial Stakeholders (Ralph and Roger McCannon and Darwin Vikerz)	Mar 2, 2015; Jul 23, 2015
Julian Nabozny	Oct 31, 2013; Oct 20, 2014; Oct 2, 2015
Juneteenth	Jun 16, 2012; Jun 15, 2013
Lane Trophy	Nov 19, 2015
Latino Institute Back to School Fair	Jul 14, 2012
Lincoln Ragsdale and Charles Hubbard	Mar 5, 2015; Sep 3, 2015
Lowell Elementary School	Jun 18, 2013
Marcos de Niza Tenant Council Meeting	Apr 29, 2013
Michael Kelly	Oct 9, 2014
NFL Yet Academy	Nov 15, 2013
Phoenix Community Alliance	May 9, 2012; Jun 6, 2012; May 8, 2013
Phoenix Revitalization Corporation	May 10, 2012; Jun 22, 2012; Aug 23, 2012; Nov 17, 2012; Jun 24, 2015
PRC Business and Faith Based Community Group	Aug 23, 2012; Mar 20, 2013; Oct 23, 2014
Phoenix Union High School District	Jun 14, 2012
Pilgrim Rest Baptist Church	Jun 13, 2013
Plaza de Las Culturas Planning Workshop	Oct 1, 2014
Raza Development Group (Tommy Espinoza and Victor Vidales)	May 7, 2015; Jun 9, 2015; Jul 21, 2015; Aug 12, 2015
RED Development/CityScape	Oct 21, 2014
Rio Salado RDA meeting with property owners	Feb 24, 2014
South Central GAIN	Oct 19, 2013
South Mountain Festival of Thanksgiving Parade	Nov 3, 2012; Nov 2, 2013
South Mountain Target Area B	Apr 25, 2012; Nov 28, 2012; Mar 27, 2013; Dec 4, 2014
South Mountain Village Block Watch	Jan 21, 2014
South Mountain/Laveen Chamber of Commerce	Jun 4, 2012
South Mountain/Laveen Fun Fest	Dec 14, 2013
Spirit of South Mountain Community Awards	Apr 25, 2013
St. Catherine of Siena Building Community Event	Sep 19, 2015
St. Catherine of Siena/St. Anthony's Church	Jun 17, 2013
Sustainable Communities Working Group	Jun 5, 2012
USDOT LadderSTEP Empowerment Pilot/Workshop	May 1, 2015
Valle del Sol	May 21, 2012
Victor Vidales	Sep 6, 2012; May 8, 2013
YMCA	Jun 18, 2013

4.6 PUBLIC REVIEW OF THE ENVIRONMENTAL ASSESSMENT

The EA was released for public review on May 10, 2016, and remained available for review until June 13, 2016. The Notice of Availability of the EA and notice for the public meeting was issued in local newspapers including the *Arizona Republic* and *La Voz* (Spanish-language publication). The EA was also announced through news releases and media advisories in both English and Spanish, distribution of over 13,000 bilingual door hangers throughout the corridor and broadcasts on local news programs. Copies of the EA were made available for viewing at the South Mountain Community Center and Nina Mason Pulliam Rio Salado Audubon Center in Phoenix. The EA was posted on the Valley Metro website at:

http://www.valleymetro.org/projects_and_planning/project_detail/south_central.

A public open house meeting was held at the Nina Mason Pulliam Rio Salado Audubon Center on May 25, 2016. During the review period, FTA and Valley Metro received 1 comment by email, 16 written comments at the public meeting and 6 comments by mail. A list of comments received during the public comment period and responses to those comments are included in Appendix N, *Comments Received on the Draft EA and Responses*.

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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 the Build Alternative and discusses the federal and local financial resources that would be used to fund the 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 New Starts discretionary grant funding for the Build Alternative, but these funds have not yet been programmed.

The estimated total capital cost for the 5-mile Build Alternative evaluated in this EA is approximately \$623 million in year-of-expenditure dollars. Approximately 50.5 percent (\$314.6 million) of the funds for capital costs is programmed to come from the Proposition 104 Local Transportation Tax approved by Phoenix voters in 2015 as the local match. The remaining 49.5 percent (\$308.4 million) of the funding would be derived from the New Starts discretionary grant program.

No funds from the State of Arizona would 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 \$)	Percentage of Total Capital Costs
Federal		
New Starts	308.4	49.5
Local		
Proposition 104	314.6	50.5
Total	623.0	100

The estimated annual operating cost for the Build Alternative is approximately \$6 million in opening year dollars. Approximately 75 percent (\$4.5 million) of the funds that would be used for operations would be supported by a dedicated City of Phoenix transportation tax, which was approved by voters in August 2015. The remaining 25 percent (\$1.5 million) 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 (for fiscal year 2014). Table 5-2 outlines the estimated annual operating costs and funding sources.

TABLE 5-2: ESTIMATED ANNUAL OPERATING COSTS AND FUNDING SOURCES

Source	Amount (million \$)	Percentage of Total Operating Costs
Proposition 104	4.5	75
Farebox recovery	1.5	25
Total	6.0	100

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