

Glendale Streetcar Feasibility Study

FINAL REPORT

March 2022

Task No. C5

HNTB

In Association with:

Kittelson & Associates, Inc.

Studio-MLA

Arellano Associates

ACKNOWLEDGEMENTS

CITY COUNCIL

- Paula Devine, Mayor
- Ara Najarian
- Vrej Agajanian
- Ardy Kassakhian
- Daniel Brotman
- Roubik Golanian, PE. City Manager

CONSULTANT TEAM

HNTB

- Steven Greene, PhD, Project Manager
- Carolyn Seboe, AICP, Lead Planner
- Michael Hammond, Project Planner
- Elenna Salcido, AICP, Project Planner
- Shireen Mahdavi, EIT, Project Engineer
- Amjad Hussain, Cost Estimating

Studio-MLA

- Jan Dyer, PLA, ASLA, Urban Design Lead
- Manuel Merino, Urban Designer

Kittelson & Associates, Inc.

- Tim A. Erney, AICP/PTP/CTP, Traffic Analysis Lead

TECHNICAL ADVISORY COMMITTEE

- Philip S. Lanzafame, Director Community Development
- Bradley Calvert, Assistant Director Community Development
- Fred Zohrehvand, Principal Mobility Planner, Project Manager
- Edward Hitti, Former Deputy Director and City Engineer, Public Works
- Sarkis Oganessian, Principal Civil Engineer
- Pastor Casanova, Principal Traffic Engineer, Public Works
- Arezoo Kamali, Associate Planner, Community Development

TABLE OF CONTENTS

Acknowledgements	i
Table of Contents	ii
Abbreviations/Acronyms	vii
1. Introduction	1-1
1.1. Study Background	1-1
1.2. Project Purpose and Function	1-1
1.3. Streetcar Overview	1-2
1.4. Report Purpose and Structure	1-2
2. Streetcar Study Area	2-1
2.1. Demographic Context	2-1
2.2. Land Use and Development Trends	2-5
2.3. Transportation Infrastructure	2-8
2.3.1. Freeways and Arterials	2-8
2.3.2. Transit and Rail	2-8
2.3.3. Active Transportation	2-12
2.4. Relevant Local Plans	2-17
2.4.1. South Glendale Community Plan	2-17
2.4.2. Tropic Center Plan	2-19
2.4.3. Downtown Specific Plan	2-19
3. Preliminary Alternatives	3-1
3.1. Route Development	3-1
3.2. Route Alignments and Station Locations	3-3
3.3. Station Design	3-7
3.4. Ancillary Facilities	3-10
3.4.1. Operations and Maintenance Facility	3-10
3.4.2. Traction Electrification System	3-12
3.5. Vehicles and Technology	3-13
3.6. Preliminary Operations Plan	3-13
3.6.1. Travel Times	3-13
3.6.2. Service Assumptions	3-15
3.7. Fare Policy	3-15

4. Evaluation of Preliminary Alternatives	4-1
4.1.1. Activity Generators.....	4-1
4.1.2. Ridership.....	4-6
4.1.3. Economic Development	4-7
4.1.4. Transportation Connectivity	4-8
4.1.5. User Experience.....	4-8
4.1.6. Utilities	4-9
4.1.7. Traffic Impacts.....	4-9
4.1.8. Parking Impacts	4-11
4.1.9. Construction Considerations.....	4-13
4.2. Comparison of Preliminary Alternatives	4-14
5. Recommended Alternative Integration	5-1
5.1. Transit Interface	5-1
5.1.1. Planned Transit System Interface Locations	5-1
5.1.2. Conceptual Transit Service Modifications.....	5-3
5.2. First/Last Mile Connections.....	5-4
6. Cost Estimates	6-1
6.1. Capital Costs	6-1
6.2. Operating Costs	6-2
7. Implementation strategy	7-1
7.1. Funding Strategies	7-1
7.1.1. Case Studies.....	7-1
7.1.2. Key Funding Sources Inventory	7-4
7.2. Capital Investment Grant Readiness Assessment	7-9
7.2.1. Capital Investment Grant Ratings	7-10
7.2.2. Preliminary Ratings Assessment	7-11
7.2.3. CIG Preliminary Ratings Assessment.....	7-20
7.3. Approvals and Actions Required	7-21
7.3.1. Permits and Approvals	7-21
7.3.2. Actions to Implement.....	7-22
7.4. Implementation Timeline	7-23
8. References.....	8-1

FIGURES

Figure 2-1. Study Area Overview	2-2
Figure 2-2. Population Density.....	2-3
Figure 2-3. Job Density.....	2-4
Figure 2-4. Existing Land Use	2-6
Figure 2-5. Developments Between 2008 and 2018	2-7
Figure 2-6. Existing Transit Routes in the Study Area.....	2-9
Figure 2-7. North Hollywood to Pasadena Transit Corridor	2-10
Figure 2-8. Metrolink Antelope Valley and Ventura County Lines	2-12
Figure 2-9. Existing Bike Facilities	2-14
Figure 2-10. Glendale Citywide Pedestrian Plan Project Corridors	2-16
Figure 2-11. South Glendale Community Plan Vision Areas.....	2-18
Figure 2-12. Downtown Specific Plan Districts	2-20
Figure 3-1. Route Alternatives	3-2
Figure 3-2. Existing Cross-Section on Central Avenue, San Fernando Road to Colorado Street, Looking North	3-3
Figure 3-3. Alternative 1 Cross-Section on Central Avenue, San Fernando Road to Colorado Street, Looking North.....	3-3
Figure 3-4. Existing Cross-Section on Central Avenue, Colorado Street to Stocker Street, Looking North	3-4
Figure 3-5. Alternative 1 Cross-Section on Central Avenue, Colorado Street to Stocker Street, Looking North	3-4
Figure 3-6. Existing Cross-Section on Brand Boulevard, Colorado Street to Broadway, Looking North.....	3-5
Figure 3-7. Alternative 1 Cross-Section on Brand Boulevard, Colorado Street to Broadway, Looking North	3-5
Figure 3-8. Alternative 2 Cross-Section on Brand Boulevard, Colorado Street to Broadway, Looking North	3-6
Figure 3-9. Bump-Out Station – Typical Layout	3-8
Figure 3-10. Sidewalk Station – Typical Layout	3-8
Figure 3-11. Rendering of Potential Station on Central Avenue near Laurel Street	3-9
Figure 3-12. Rendering of Potential Station on Brand Boulevard near Broadway.....	3-9
Figure 3-13. Rendering of Potential Station on Brand Boulevard near California Avenue	3-10

Figure 3-14. Seattle First Hill Streetcar Operations and Maintenance Facility 3-11
Figure 3-15. Conceptual OMF Layout at Glendale Transportation Center 3-12
Figure 4-1. Districts and Destinations 4-2
Figure 4-2. Housing Units 4-3
Figure 4-3. Commercial Square Feet 4-4
Figure 4-4. Transit Users 4-5
Figure 5-1. Proposed Brand Boulevard/SR-134 First/Last Mile Improvements 5-5
Figure 7-1. Capital Investment Grant Weighting Factors 7-11
Figure 7-2. Implementation Schedule 7-24

TABLES

Table 2-1. Existing Land Uses within Study Area (2018) 2-5
Table 2-2. Metro Transit Lines through the Study Area 2-8
Table 2-3. Glendale Beeline Routes 2-10
Table 2-4. Glendale Citywide Pedestrian Plan Recommendations in the Study Area 2-16
Table 3-1. Streetcar Vehicles and their Key Characteristic 3-13
Table 3-2. Estimated Travel Times 3-14
Table 3-3. Travel Scenarios - GTC to California Avenue/Brand Boulevard 3-14
Table 3-4. Operating Schedule 3-15
Table 3-5. Example Fare Systems 3-16
Table 4-1. Activity Generators 4-1
Table 4-2. Parking Impacts due to Guideway on Brand Boulevard 4-12
Table 4-3. Route Alternatives Summary 4-14
Table 5-1. Metro and Glendale Beeline Interface with Proposed Streetcar Stations 5-1
Table 6-1. Summary of Capital Cost Estimates (2020 Dollars, x000) 6-2
Table 6-2. Total Allocated and Unallocated Contingency (2020 Dollars, x000) 6-2
Table 6-3. Case Study Operating Costs 6-3
Table 6-4. Conceptual Operating Plan and Costs 6-3
Table 7-1. KC Streetcar Funding Sources 7-2
Table 7-2. QLINE Funding Sources 7-3
Table 7-3. The Hop Funding Sources 7-4

Table 7-4. Potential Funding Sources 7-4
Table 7-5. Land Use Criteria Summary 7-15
Table 7-6. Commitment of Funds Ratings 7-19
Table 7-7. Financial Plan Criteria 7-19
Table 7-8. Preliminary CIG Ratings..... 7-20
Table 7-9. Implementation Actions 7-22

ABBREVIATIONS/ACRONYMS

AACE	Association of Cost Engineers
ADA	Americans with Disabilities Act
a.m.	ante meridiem (before midday)
BRT	Bus Rapid Transit
BUILD	Better Utilizing Investments to Leverage Development
CalSTA	California State Transportation Agency
Caltrans	California Department of Transportation
CBD	Central Business District
CIG	Capital Investment Grant
CMAQ	Congestion Mitigation and Air Quality
DOT	Department of Transportation
EFID	Enhanced Infrastructure Finance Districts
ESS	energy storage system
FAST	Fixing America’s Surface Transportation
FFGA	Full Funding Grant Agreement
FTA	Federal Transit Administration
GTC	Glendale Transportation Center
KC	Kansas City
KCSA	Kansas City Streetcar Authority
LA	Los Angeles
LAX	Los Angeles International Airport
LCTOP	Low Carbon Transit Operations Program
LPA	Locally Preferred Alternative
LRT	Light Rail Transit
LTF	Local Transportation Fund
MARTA	Metropolitans Atlanta Rapid Transit Authority
Metro	Los Angeles County Metropolitan Transportation Authority
NEPA	National Environmental Policy Act
NMTC	New Market Tax Credit
OC	Orange County
OCS	overhead contact system
OMF	operations and maintenance facility
PM	post meridiem (after midday)
RAISE	Rebuilding American Infrastructure with sustainability and Equity
SCC	Standard Cost Categories

SGCP	South Glendale Community Plan
SR	State Route
STA	State Transit Assistance
STIP	State Transportation Improvement
STOPS	Simplified Trips on Project Software
TBD	To be determined
TC	Tropico Center
TDA	Transportation Development Act
TDD	Transportation Development District
TES	Traction Electrification System
TID	Tax Incremental Districts
TIF	tax increment financing
TIFIA	Transportation Infrastructure and Finance Innovation Act
TIGER	Transportation Investment Generating Economic Recovery
TOD	Transit-oriented Development
TPSS	traction power substations
TRB	Transportation Research Board
U.S.	United States
U.S. DOT	U.S. Department of Transportation
VMT	vehicle miles traveled
WPF	Wisconsin Policy Forum

1. INTRODUCTION

1.1. STUDY BACKGROUND

The City of Glendale commissioned the Glendale Streetcar Feasibility Study to develop and analyze options to improve mobility through the Central Avenue/Brand Boulevard Corridor with a focus on modern streetcar technologies. The purpose of the study is to provide the necessary information to enable the City of Glendale to advance the project further through subsequent public engagement, alternative selection, environmental review, and design.

Central Avenue and Brand Boulevard serve as major north/south arterials through Downtown Glendale where existing local and regional transit services operate. Several transit projects are concurrently being developed by the City of Glendale and the Los Angeles Metropolitan Transportation Authority (Metro) near Downtown Glendale that will enhance connectivity with the proposed streetcar along this north-south corridor. Additionally, the City of Burbank has expressed an interest in having connectivity with a streetcar corridor with potential hubs in Downtown Burbank, Burbank Airport, and Media District.

1.2. PROJECT PURPOSE AND FUNCTION

The purpose of the project is to reintroduce streetcar service using modern, highly visible and efficient streetcar vehicles along a route that will serve as a high-capacity transit corridor linking the Glendale Transportation Center (GTC), served by Metrolink and Amtrak, with downtown Glendale and adjacent neighborhoods/business districts to the north and south of downtown. The route, historically served by the Pacific Electric streetcar system, will also serve as a potential first phase of a future system extending towards Burbank. The streetcar will address congestion and growing travel demand by increasing multimodal transportation connectivity, enhancing local trip circulation and providing a direct connection to regional rail and transit services. The streetcar's fixed guideway will facilitate local land use and economic development goals and become a catalyst for positive change and placemaking in Glendale's City Center.

The streetcar will help Glendale achieve its land use, economic and mobility goals by:

- Providing a transportation alternative to serve a dense and expanding residential and employment base.
- Facilitating transit-oriented, walkable, and mixed-use neighborhoods.
- Improving local circulation to enhance connectivity between neighborhoods and business districts.
- Increasing access to regional transit modes by providing first/last mile transport for workers, residents, and visitors.

1.3. STREETCAR OVERVIEW

Streetcars are public transit vehicles that provide local circulation in urban areas. Streetcars run along tracks embedded in concrete in the roadway and are powered by overhead electric wires or onboard energy storage (batteries). Streetcars are particularly adaptable to city streets since they operate in mixed traffic at street speeds and negotiate tighter curves like a bus. Traffic signal priority or pre-emption at specific locations such as intersections may be used to facilitate smooth operations.

Streetcar lines are typically 2 to 5 miles long with frequent stops that are several blocks apart. Streetcar stations are built into the sidewalk or a median island. They are similar in scale to bus shelters, and have level boarding platforms, shelters, seating, fare collection and passenger information displays that are designed to fit the urban context.

Streetcars are meant for relatively short intraurban trips that circulate people throughout downtown and between neighborhood districts and destinations. Streetcars serve some shorter work-related trips but tend to be used most heavily throughout the day and during the weekends for shopping, dining, entertainment, and other personal travel needs. Streetcars are known as pedestrian accelerators since they are typically used for trips that are too far to walk to and inconvenient to drive to.

Streetcars are an important component of a multimodal transportation system since they typically intersect with other transit, pedestrian, and bicycle modes. They also provide a high-quality, last-mile connection to and from regional rail and bus transportation centers.

1.4. REPORT PURPOSE AND STRUCTURE

This report presents the methodology and conclusions of the Glendale Streetcar Feasibility Study. Chapter 2 provides an overview of the study area, including existing demographic, land use, and transportation conditions. Chapter 3 describes two conceptual route alignments, including their physical and operational characteristics.

STREETCAR BENEFITS

- Provide direct connectivity between neighborhoods and destinations, reducing barriers to mobility.
- Draw economic development because the route is permanent.
- Attract transit users with superior ride quality, accessibility, and easy-to-understand operations.
- Promote environmental sustainability since streetcars are electric and reduce auto reliance.

STREETCAR FEATURES

- Provide local circulation in urban areas via modern public transit vehicles.
- Use tracks embedded in concrete, flush with the pavement surface.
- Run on overhead electric power or onboard energy storage (batteries).
- Operate in mixed traffic at street speeds and navigate roadway lanes like a bus.
- Serve routes that are typically two to five miles long with frequent stops.
- Integrate into the built environment with level-boarding platforms at stations.

Chapter 4 evaluates the two alternatives based on factors such as ridership, economic development potential, transportation benefits and impacts, and cost. It also recommends a preferred alternative for further design and analysis. Chapter 5 provides recommendation for integrating the preferred alternative into the surrounding transportation network. Chapter 6 presents estimates of capital and operating costs for the preferred alternative. Finally, Chapter 7 identifies preliminary implementation steps for the project.

2. STREETCAR STUDY AREA

The study area designated for the Glendale Streetcar Feasibility Study, shown in **Figure 2-1**, extends from the existing Glendale Metrolink/Amtrak Station (Glendale Transportation Center) through downtown Glendale along Central Avenue and Brand Boulevard. The study area includes areas of up to 0.5 mile west and east of Central Avenue and Brand Boulevard, respectively, and includes the following neighborhoods: Tropic, Pacific Edison, Mariposa, City Center, Vineyard, Fremont Park, and Verdugo Viejo. These areas could be subject to impacts and benefits from one or more of the streetcar alternatives.

STUDY AREA STATISTICS

- Population: 62,000
- Population density: 16,500
- Population growth: 7%
- Jobs: 43,000
- Job density: 11,400

2.1. DEMOGRAPHIC CONTEXT

The study area has nearly 62,000 residents with a population density of 16,522 people per square mile. The study area's population increased by 7 percent (%) between 2010 and 2015. Population growth in the study area is attributed to new development of higher-density residential uses particularly in the downtown Glendale area, where hundreds of new units have been added in recent years. The most current population density data within the study area can be seen in **Figure 2-2**.

The study area has close to 43,000 jobs with a job density of over 11,400 jobs per square mile. Employment density in the study area is over three times that of Glendale and more than ten times that of Los Angeles County. Employment is primarily concentrated in the northern half of the study area, with the greatest concentrations of employment located to the west of Brand Boulevard and surrounding Glendale Galleria. Existing job density within the study area is shown in **Figure 2-3**.

Figure 2-1. Study Area Overview

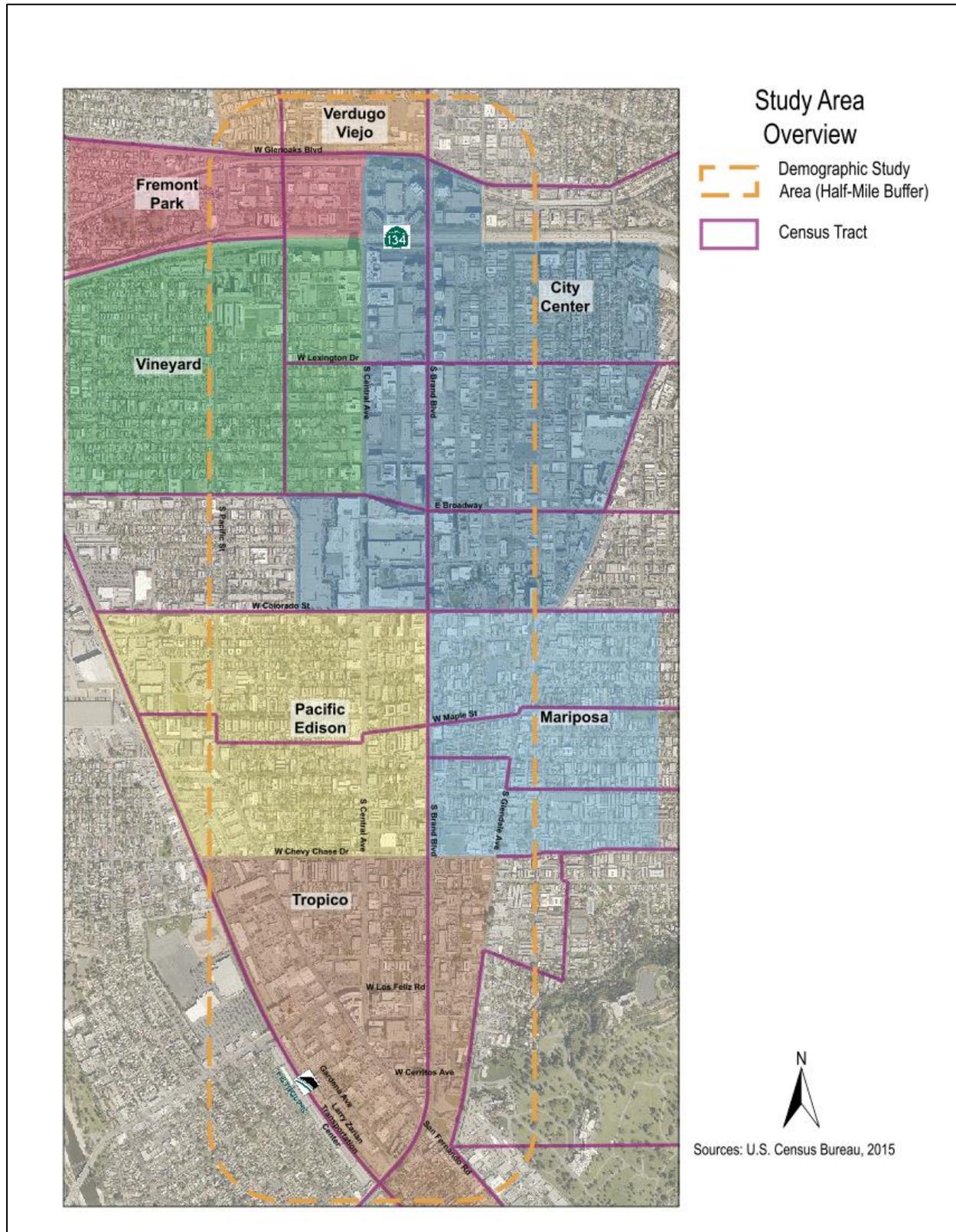


Figure 2-2. Population Density

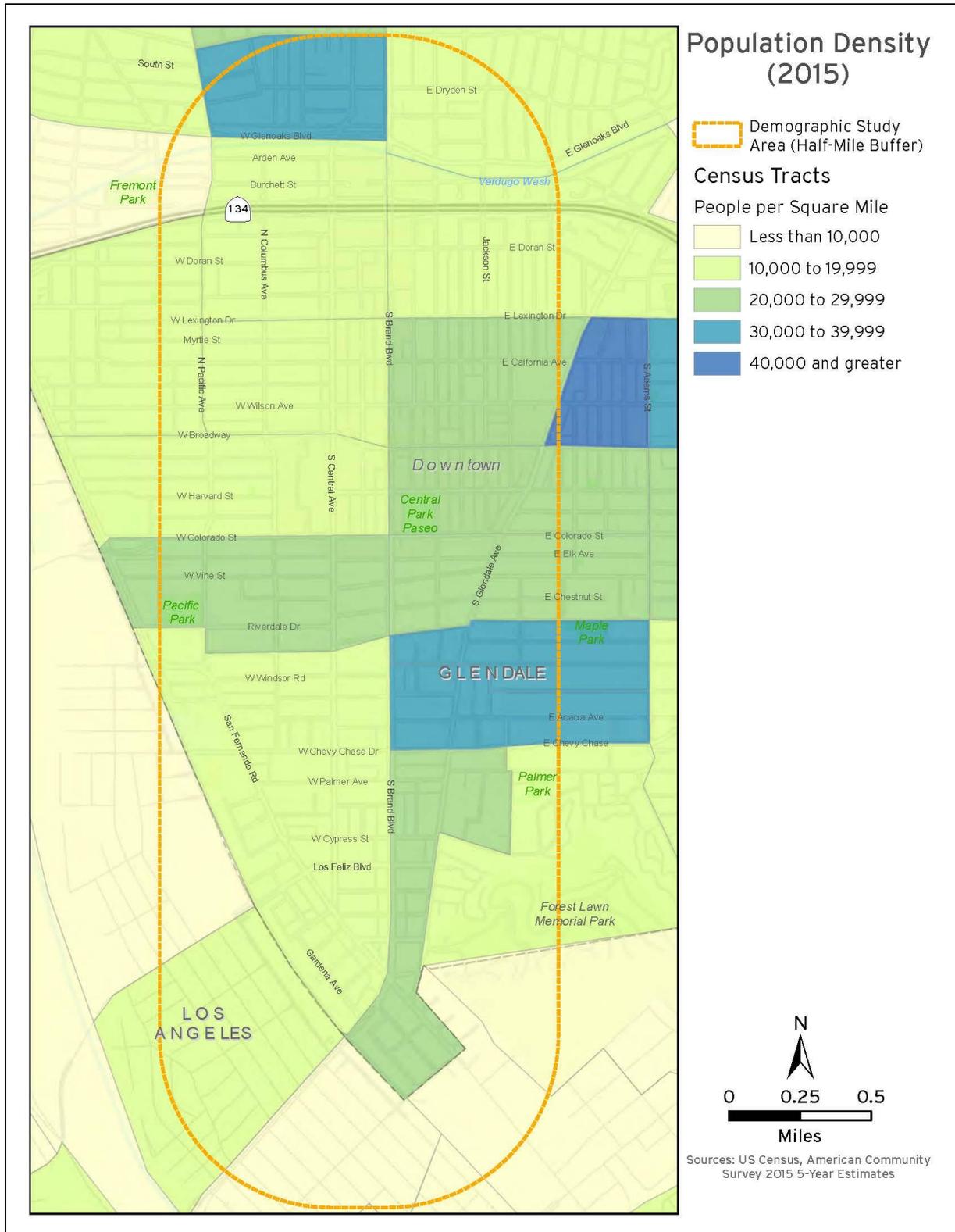
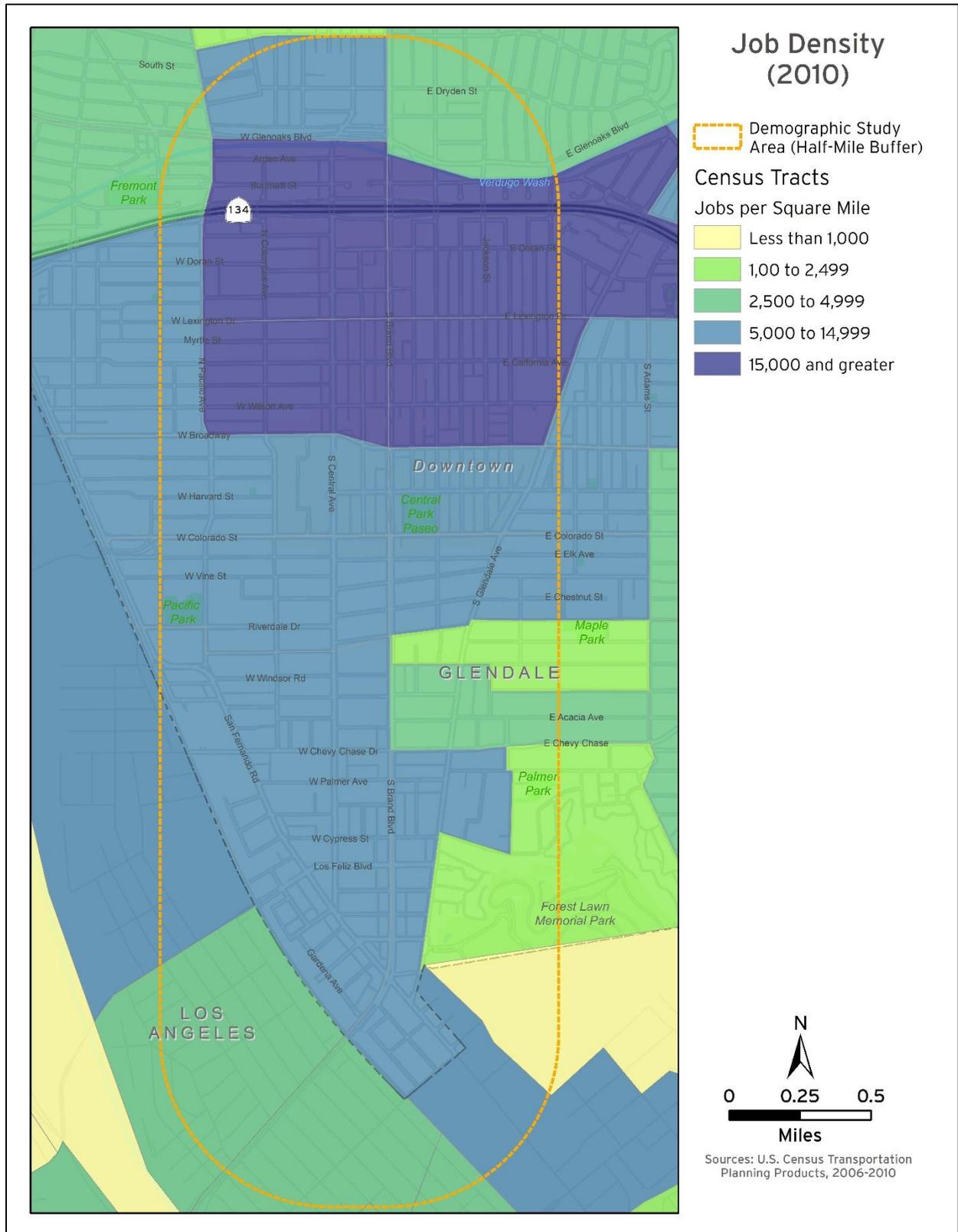


Figure 2-3. Job Density



2.2. LAND USE AND DEVELOPMENT TRENDS

Table 2-1 summarizes the land uses within the study area and **Figure 2-4** shows the existing land uses on a map. Nearly half (48%) of the land uses within the study area are residential. Commercial land use comprises more than a quarter (26%) of the study area. Commercial uses are concentrated along Central Avenue, Brand Boulevard, and Glendale Avenue. Institutional and government land uses make up approximately 15% of the study area. Industrial land uses comprise 9% of the study area, and are concentrated in the southern portion of the study area.

Table 2-1. Existing Land Uses within Study Area (2018)

Use	Acres	Percent of Total
Residential	810	48
Commercial	445	26
Institutional & Government	241	15
Industrial	151	9
Recreational	23	1
Miscellaneous	23	1
Total	1,693	100

Source: City of Glendale Assessor, 2018

Brand Boulevard, in the downtown area, contains major retail and shopping centers and multi-story high-rise office uses north of Lexington Drive. Brand Boulevard, south of Colorado Street, is dominated by car dealership buildings and surface parking lots.

Central Avenue in the downtown area consists of several multi-story residential and mixed-use buildings intermixed with small-scale, single-story retail and service uses. Central Avenue, south of Colorado Street, is predominantly single-story retail and service uses that line the street with some surface parking lots.

Recent major developments in the study area, as shown in **Figure 2-5**, are concentrated in areas north of Colorado Street in the downtown area. Most developments within the past 5 years have been along Central Avenue as the corridor has seen several relatively new multi-story residential buildings, including the Modera, Altana, Next on Lex, Onyx, Lex on Orange, Legendary, and The Harrison. Brand Boulevard is experiencing similar development as the conceptual design of Lucia Park, a proposed 35-story, 348-unit residential apartment project at 610 North Brand Boulevard, was approved by the Glendale City Council in January 2020.

MAJOR ACTIVITY CENTERS

- Glendale Galleria
- The Americana at Brand
- Glendale Memorial Hospital
- Nestle USA headquarters

Figure 2-4. Existing Land Use

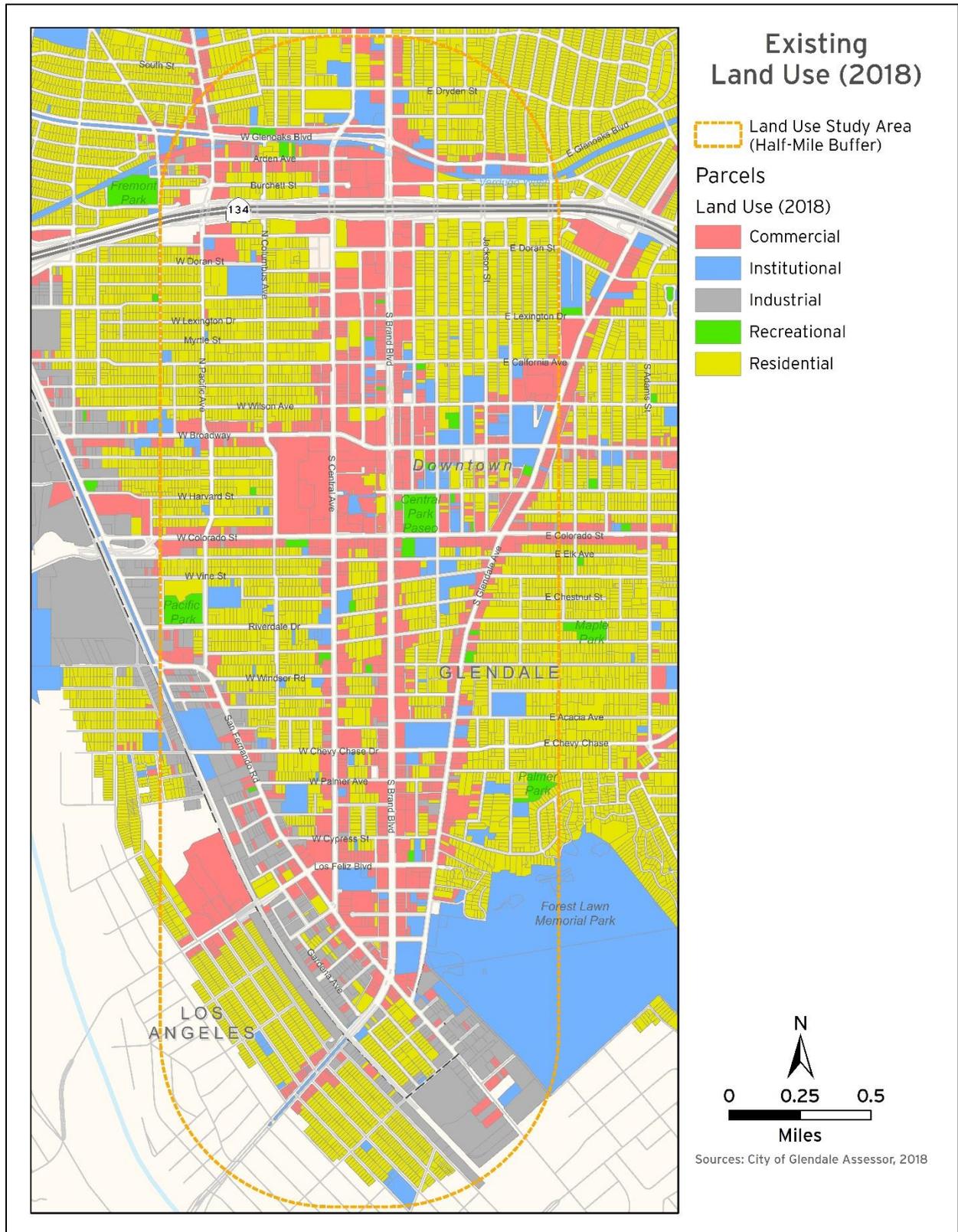
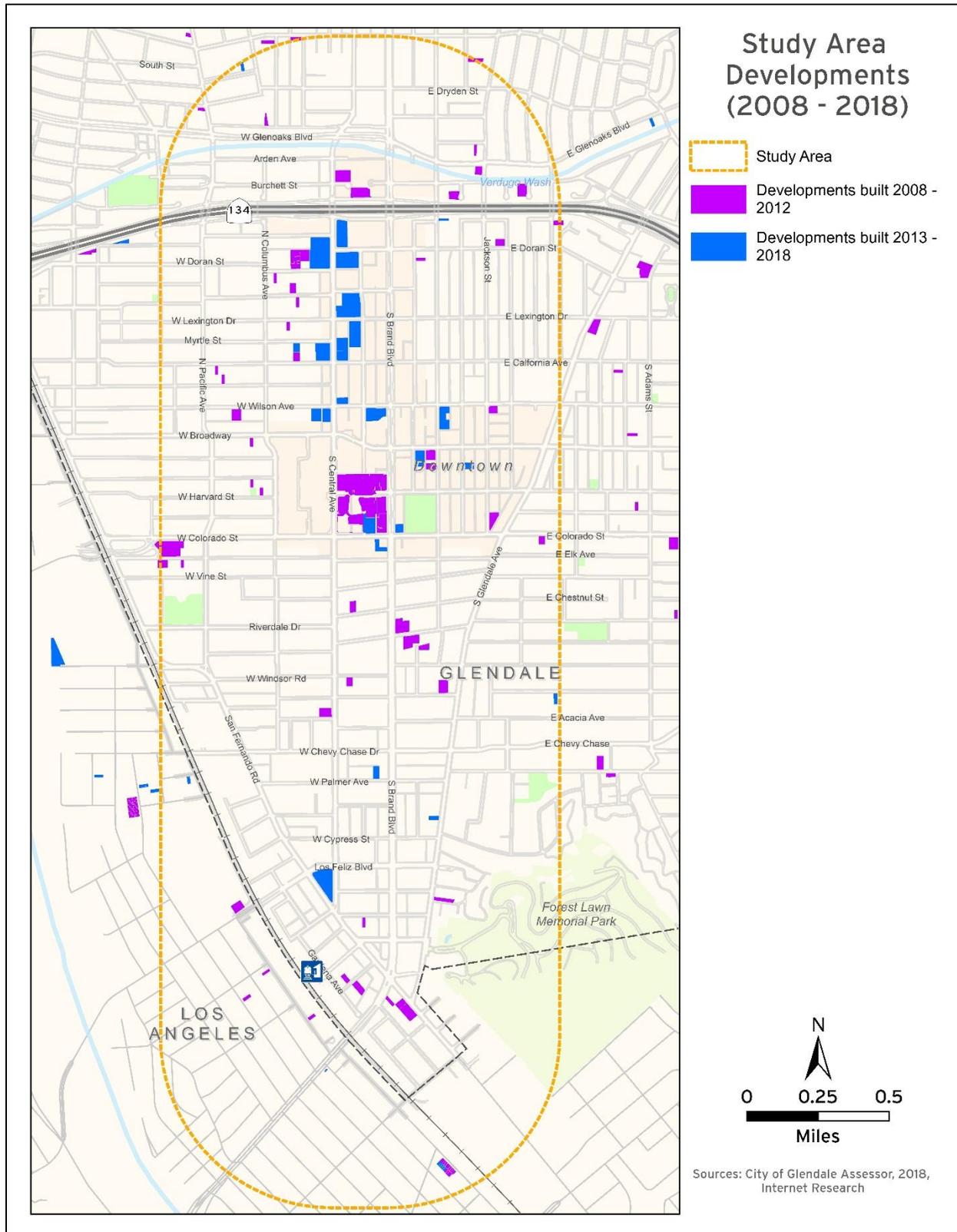


Figure 2-5. Developments Between 2008 and 2018



2.3. TRANSPORTATION INFRASTRUCTURE

This section provides an overview of the existing transportation infrastructure in the study area.

2.3.1. Freeways and Arterials

The study area is served by a comprehensive freeway and arterial system. Most arterial roadways through the study area are oriented in a grid pattern, with major streets approximately a quarter to 0.5 mile apart. Major freeways and arterial roadways serving the study area and its vicinity include:

- North/South Freeways: I-5 (Golden State Freeway), State Route (SR)-2 (Glendale Freeway)
- East/West Freeway: SR-134 (Ventura Freeway)
- East/West Arterials: Glenoaks Boulevard, Wilson Avenue, Colorado Street, Broadway, Chevy Chase Drive
- North/South Arterials: Pacific Avenue, Central Avenue, Brand Boulevard, and Glendale Avenue

2.3.2. Transit and Rail

Figure 2-6 shows the transit routes in the study area, which is served by several Metro and Glendale Beeline routes, as well as Metrolink rail service. The Glendale Beeline operates fixed route buses that circulate on nine routes providing service to commercial, educational, and medical destinations within the study area. Metro also provides local, express, and shuttle bus service throughout the study area. The Los Angeles Department of Transportation (DOT) operates a Commuter Express line through the northern part of the study area.

Metro

Metro operates an extensive network of bus lines through the study area, including local, shuttle, and express services. **Table 2-2** summarizes the frequency and span of service of Metro routes in the Study Area.

Table 2-2. Metro Transit Lines through the Study Area

Line	Description	Peak Period Headway	Span of Service
Metro Local 92	Downtown Los Angeles to Sylmar/San Fernando Station	25 minutes	24 hours
Metro Local 94	Downtown Los Angeles to North Hollywood Station	15 minutes	M-Su: 4:37 a.m. to 2:46 a.m.
Metro Local 180	Hollywood to Pasadena	10-12 minutes	24 hours
Metro Shuttle 603	Downtown Los Angeles to Glendale Galleria	12 minutes	M-F: 5:03 a.m. to 11:15 p.m. S-Su: 5:28 a.m. to 11:15 p.m.
Metro Express 501	North Hollywood Station to Del Mar Station	20 minutes	M-F: 5:00 a.m. to 10:15 p.m. S-Su: 6:01 a.m. to 10:11 p.m.

Source: Metro, 2022

Figure 2-6. Existing Transit Routes in the Study Area



Source: HNTB, City of Glendale, 2022; Metro, 2022

Metro is also in the planning stages of the North Hollywood to Pasadena BRT project, which is proposed to run through the study area. In May 2021, the Metro Board of Directors approved a proposed alignment for the project (shown in **Figure 2-7**) that would operate on Central Avenue between Glenoaks Boulevard and Broadway, and on Broadway between Central Avenue and Colorado Boulevard in Eagle Rock, with stops at the Central Avenue/Lexington Drive and Brand Boulevard/Broadway intersections.

Figure 2-7. North Hollywood to Pasadena Transit Corridor



Source: Metro, 2021

Glendale Beeline

The City of Glendale’s Beeline circulates along ten routes through the study area that provide service to commercial, educational, and medical destinations. **Table 2-3** summarizes the Beeline routes.

Table 2-3. Glendale Beeline Routes

Line	Description	Peak Headway	Span of Service
Route 1	Connects Verdugo Viejo neighborhood to Tropico neighborhood along Central Avenue, through Downtown Glendale	10 minutes	M-F: 6:00 a.m. to 7:45 p.m. S-Su: 9:00 a.m. to 6:00 p.m.
Route 3/31	Service from Downtown Glendale to North Glendale with additional service to the adjacent communities of Montrose, La Crescenta, and La Cañada-Flintridge (LCF) terminating at the NASA Jet Propulsion Laboratory (JPL); Route 31	20-30 minutes	M-F (3): 5:15 a.m. to 9:00 p.m. S (31): 9:00 a.m. to 6:00 p.m.

Line	Description	Peak Headway	Span of Service
	operates on Saturday only and terminates service at La Crescenta		
Route 4	Connects Downtown Glendale to the Mariposa and Tropic neighborhoods along Broadway, Harvard Street, Chevy Chase Drive, and S Central Avenue	10 minutes	M-F: 6:00 a.m. to 6:45 p.m. S-Su: 9:00 a.m. to 5:00 p.m.
Route 5	Connects the Pacific Edison, Vineyard, Fremont Park, North Glendale, and Verdugo Viejo, and Glenwood neighborhoods primarily along Pacific Avenue	18 minutes	M-F: 6:30 a.m. to 6:30 p.m. S-Su: 9:00 a.m. to 5:00 p.m.
Route 6	Connects the Pacific Edison, Mariposa, Citrus Grove, and Somerset neighborhoods primarily along Colorado Street through Downtown Glendale	20 minutes	M-F: 6:30 a.m. to 6:30 p.m. S: 9:00 a.m. to 5:00 p.m.
Route 7	Connects Grand Central, Grandview, Glenwood, Verdugo Viejo, Fremont Park, North Glendale, Rossmoyne, Woodbury and College Hills neighborhoods primarily along Glenoaks Boulevard	25-40 minutes	M-F: 6:30 a.m. to 7:00 p.m. S: 9:00 a.m. to 5:30 p.m.
Route 8	Connects the Tropic, Atwater, Mariposa, Citrus Grove, Woodbury, and College Hill neighborhoods through Downtown Glendale primarily along Glendale Avenue	Scheduled to meet trains	M-F: 6:00 a.m. to 6:30 p.m. S: 9:00 a.m. to 5:30 p.m.
Route 11	Metrolink express route service intended to coordinate with scheduled train arrivals. Connects the GTC to the Fremont Park, North Glendale, Mariposa, Pacific Edison, and Tropic neighborhoods through Downtown Glendale primarily along Brand Boulevard	Scheduled to meet trains	M-F: 6:00 a.m. to 9:30 a.m. and 2:30 p.m. to 6:30 p.m.
Route 12	Metrolink express route service intended to coordinate with scheduled train arrivals. Connects the GTC to the Burbank Transportation Center, through Tropic, Pacific Edison, Moorpark, Vineyard, Pelanconi, Grand Central neighborhoods primarily along Flower Street and San Fernando Rd	30 minutes	M-F: 6:00 a.m. to 9:30 a.m. and 3:00 p.m. to 6:30 p.m.

Source: City of Glendale, 2022

Metrolink

The Southern California Regional Rail Authority operates Metrolink commuter rail service through the study area. The Antelope Valley Line and the Ventura County Line connect the Antelope Valley, Ventura County, and Downtown Los Angeles to the GTC. The two Metrolink lines are illustrated in **Figure 2-8**.

Figure 2-8. Metrolink Antelope Valley and Ventura County Lines



Source: Metrolink, 2019

2.3.3. Active Transportation

Active transportation facilities in the study area includes pedestrian and bicycle infrastructure. Existing bicycle facilities within the study area include Class II bicycle lanes (on-street striped and signed bicycle lane) and Class III bike routes (on-street shared lane bicycle routes), as shown in

Figure 2-9.

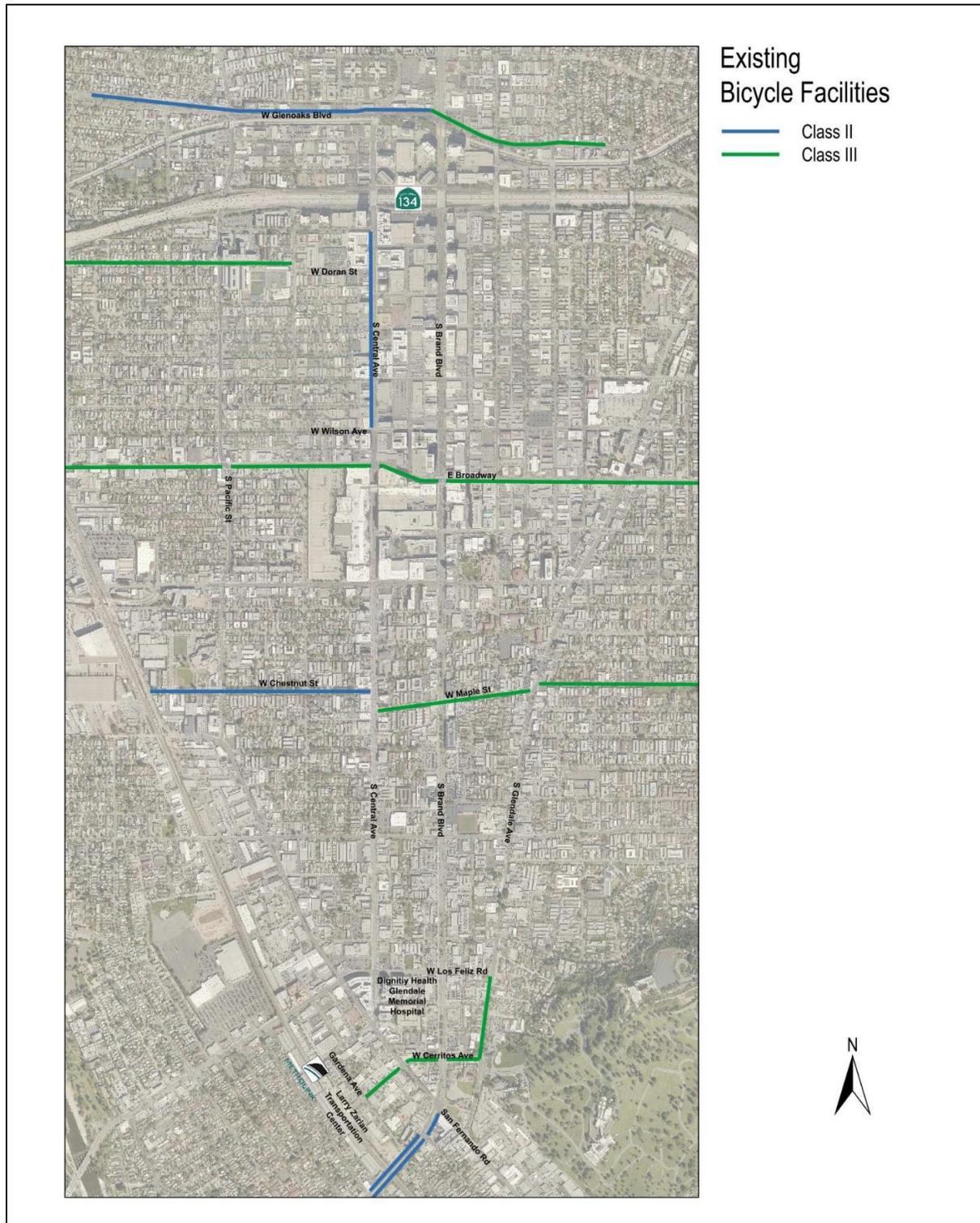
Bike facilities along north-south routes include:

- Central Avenue (Wilson Avenue to Doran Street) – Class II
- Glendale Boulevard (Metrolink Corridor to San Fernando Road) – Class II
- Glendale Avenue (Cerritos Avenue to Los Feliz Road) – Class III

Bike facilities along east-west routes include:

- Glenoaks Boulevard (Alameda Avenue to Geneva Street) – Class II/Class III
- Broadway (San Fernando Road to Wilson Avenue) – Class III
- Maple Street (Central Avenue to Verdugo Road) – Class III
- Riverside Drive (San Fernando Road to Central Avenue) – Class II
- Cerritos Avenue (Gardena Avenue to Glendale Avenue) – Class III

Figure 2-9. Existing Bike Facilities



Source: HNTB, 2019

The City of Glendale will soon be updating its bicycle plan (City of Glendale, 2012) and completing the West Glendale Sustainable Transportation and Land Use Study (City of Glendale, 2021). The study area for the West Glendale Sustainable Transportation and Land Use Study overlaps the Glendale Streetcar Feasibility Study Area in a small area north of SR-134 and west of Brand Boulevard. In this overlap area, the draft West Glendale plan recommends a protected bike lane on Glenoaks Boulevard.

In March 2021, the City of Glendale approved the *Glendale Citywide Pedestrian Plan* (City of Glendale, 2021), a long-term plan to establish a comprehensive approach to improving pedestrian infrastructure to make Glendale a safer, more pleasant, and more convenient place for walking. The plan identifies 16 corridors for near-term improvements, shown on **Figure 2-10**. **Table 2-4** shows the recommended improvements proposed to the 11 corridors within the Glendale Streetcar Feasibility Study.

Figure 2-10. Glendale Citywide Pedestrian Plan Project Corridors



Source: City of Glendale, 2021

Table 2-4. Glendale Citywide Pedestrian Plan Recommendations in the Study Area

Corridor Number	Project Location	Recommendations
2	Pacific Ave from California Ave to Ivy St	Add zebra crosswalks on California Consider removing left-turn lane and add curb extensions or add protected left-turn phase off Pacific Add high visibility crosswalks and pedestrian head starts on Wilson; consider curb extensions
3	Glendale Ave from Maple St to Cypress St	Upgrade zebra crossing at Palmer to median refuge island; move to north leg to maintain left turns Add curb extensions across Glendale at Chevy Chase Upgrade zebra crossing at Raleigh to median refuge island Upgrade zebra crossing at Garfield to median refuge island; move to north leg to maintain left turns Add curb extensions across Glendale at Windsor
5	Colorado St from Brand Blvd to Kenwood St	Upgrade zebra crossing at Kenwood to a median refuge island Add high visibility crosswalks and curb extensions across Colorado at signalized intersections

Corridor Number	Project Location	Recommendations
7	Wilson Ave from Central Ave to Adams St	Install zebra crosswalks and curb extensions on all cross streets
11	San Fernando Rd from Garfield Ave to Los Feliz Rd	Add median refuge island crossing at Garfield (north leg to maintain left turns) Add curb extensions across all feasible legs on Chevy Chase; add zebra crosswalks Add curb extensions across San Fernando at Los Feliz
12	Brand Blvd from Doran St to Colorado St	Add zebra crosswalks at all mid-block crossings; add curb extensions throughout Add protected left-turn phase at Caruso Ave
13	Brand Blvd from Maple St to Garfield Ave	Add curb extensions across Brand at Garfield
13	Pacific Ave from Stocker St to Burchett St	Add median refuge island, flashing beacon, and zebra crosswalk at Arden Close right-turn lane on southwest corner of Glenoaks and add curb extensions Add zebra crosswalks to all legs of Glenoaks Upgrade zebra crossing at Palm to median refuge island and flashing beacons Eliminate left-turn lanes on Stocker; add curb extension on southeast and northwest corners and zebra crosswalks on all legs
15	Central Ave from Glenoaks Blvd to Wilson Ave	Add zebra crosswalk at all legs at all signalized intersections Consider curb extensions at cross streets with on-street parking Add pedestrian head starts at intersections with high pedestrian volumes
16	Doran St from Central Ave to Glendale Ave	Eliminate southbound right-turn lane on Jackson St and add curb extensions Eliminate left-turn lanes on all approaches of all cross streets Add speed humps from Louise to Glendale to minimize cut-through traffic and to slow speeds

Source: City of Glendale, 2021

2.4. RELEVANT LOCAL PLANS

This section reviews relevant plans and policies for the streetcar study area.

2.4.1. South Glendale Community Plan

The *South Glendale Community Plan (SGCP)*, published in 2018, is the development guide for areas south of SR-134. The plan uses Vision Areas to highlight the anticipated level of change in various neighborhoods and corridors (see **Figure 2-11**). The SGCP highlights downtown Glendale (including Brand Boulevard and Central Avenue corridors), Central Avenue, and the Tropico Station Transit-oriented Development (TOD) as “Areas to Transform.” This indicates support for significant change in the project study area.

2.4.2. Tropico Center Plan

The Tropico Station TOD area surrounding the Glendale Transportation Center is included in the Tropico Center (TC) Plan, a component of the SGCP. The TC Plan envisions the area surrounding the train station as “a vibrant, walkable transit-oriented district.” The TC Plan proposes a transition from industrial uses near the station to a mixed-use, mostly residential neighborhood. Additionally, the plan recommends “increases in allowable height in certain areas within TOD zones, with the greatest intensity centered around Glendale Memorial Hospital and Health Center and along transit corridors.” Zoning and development standards consistent with the TC Plan are currently being developed and are anticipated to be adopted in early 2022.

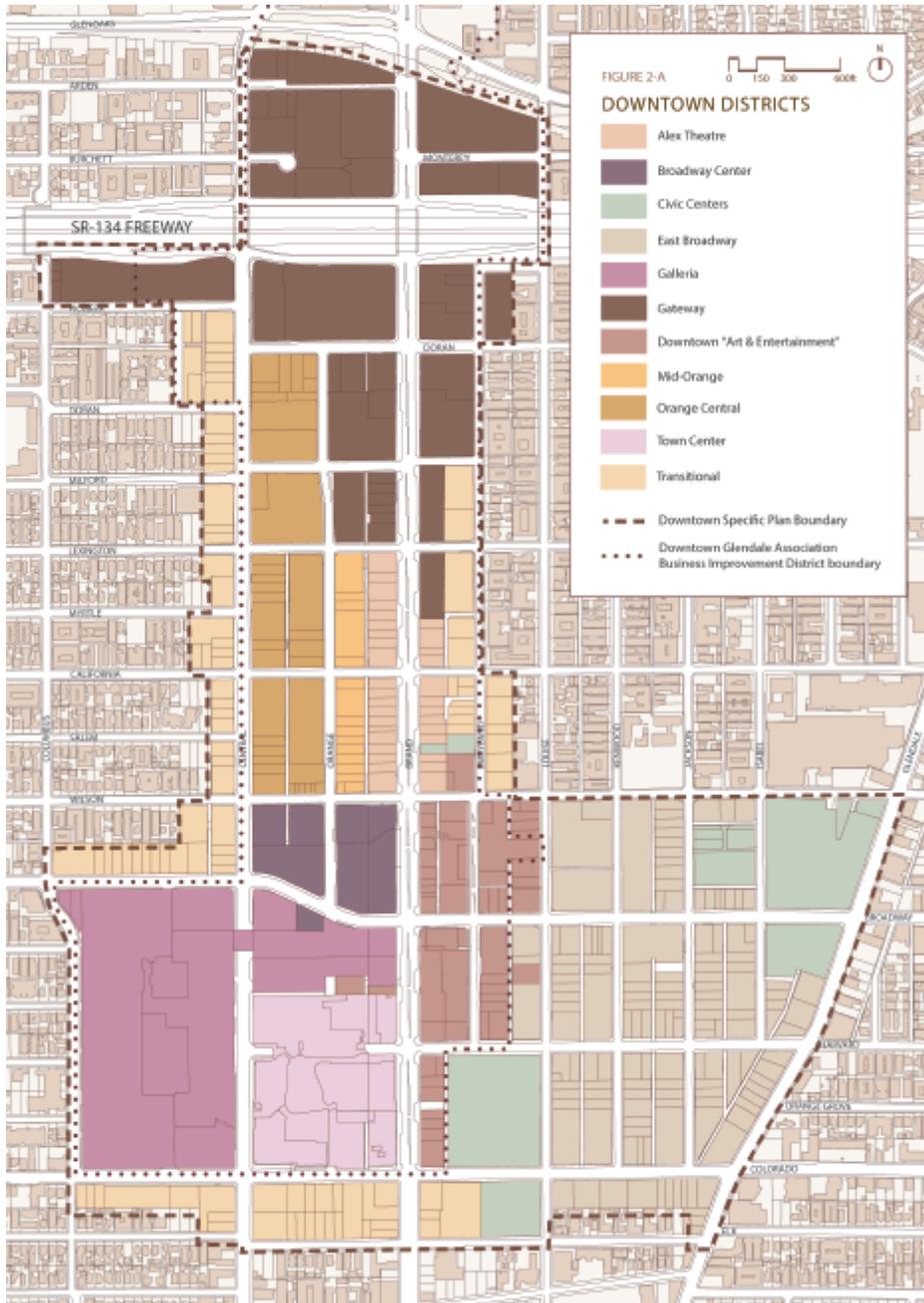
2.4.3. Downtown Specific Plan

The *Downtown Specific Plan* (City of Glendale, 2019), adopted in 2014 and amended in 2019, details the expected character and development within each downtown district (see **Figure 2-12**).

The area east of Central Avenue, between Doran Street and Wilson Street, is envisioned as a new, urban housing development comprised of mixed-use or free-standing residential buildings. This development has been underway since the plan’s release in 2014. Maximum height in the district is 95 feet by right, with up to 245 feet allowed with community benefits. The area to the west of Central Avenue, which is currently a mix of single-family and small apartments, is noted as Transitional. The plan envisions this area will transition into mid-rise mixed-use development, with an emphasis on ground floor commercial uses along Central Avenue and a maximum height of 65 feet by right and 95 feet with community benefits.

Near SR-134, the Gateway District has the highest maximum height allowable in Glendale, with a maximum height of 275 feet by right and 380 feet with community benefits. Areas surrounding the Alex Theatre on Brand Boulevard are expected to remain the same style and scale with height limits of 35 feet to 95 feet. The Broadway Center District (southwest of Brand Boulevard and Wilson Avenue) is highlighted as possible redevelopment, with the opportunity for high-rise residential, office, or mixed-use development. The Downtown “Art & Entertainment” District (southeast of Brand Boulevard and Wilson Avenue) is home to Downtown’s two more recent mixed-use commercial developments (The Exchange and The Marketplace). The district aims to encourage the concentration of arts, cultural, and entertainment venues and associated uses. Height limits in the Downtown “Art & Entertainment” District range from 65 feet by right to 95 feet with community benefits.

Figure 2-12. Downtown Specific Plan Districts



Source: City of Glendale, 2019

3. PRELIMINARY ALTERNATIVES

3.1. ROUTE DEVELOPMENT

The vision for the Glendale Streetcar was originally identified in the SGCP (City of Glendale, 2018). The Plan envisioned a streetcar along Brand Boulevard linking the Glendale Transportation Center with downtown’s retail core and then continuing west on Glenoaks Boulevard towards Burbank.

Since the primary purpose of this feasibility study is to identify and evaluate options for serving downtown Glendale, two preliminary route concepts were developed along Brand Boulevard and Central Avenue, both linking the Glendale Transportation Center (GTC) with downtown Glendale and adjacent neighborhood/business districts. These route concepts were informed by the SGCP and the demographic, land use, and transportation data reviewed in Chapter 2. The northern terminus of the streetcar route will require further study and community input, including consideration of a possible future extension to Burbank along Glenoaks Boulevard. For sake of clarity and comparison, this study utilizes Stocker Street as the northern terminus of the routes.

The two route alternatives connect major activity centers and transportation facilities in and near downtown Glendale. Both alternatives are approximately 3 miles long and serve nine station locations (or paired locations on Central Avenue and Brand Boulevard for Alternative 1). As illustrated in **Figure 3-1**, the two alternatives are as follows:

- **Alternative 1 - Central/Brand Loop:** Beginning at the GTC, this alternative runs bi-directionally (two tracks) along Central Avenue north to Lomita Avenue. North of Lomita Avenue, the alternative creates a single-track loop by running northbound on Central Avenue, then heading eastbound on Stocker Street, and then running southbound on Brand Boulevard until the route turns west on Lomita Avenue and continues south on Central Avenue.
- **Alternative 2 – Central/Brand Two-Way:** Beginning at the GTC, this alternative runs bi-directionally (two tracks) along Central Avenue north to Lomita Avenue, utilizes Lomita Avenue (or another nearby cross street) to transition to Brand Boulevard, then runs bi-directionally on Brand Boulevard to Stocker Street.

For the preliminary evaluation of both alternatives, it was assumed that the streetcars would generally operate in the right-most through travel lane, adjacent to parking lanes and other curbside uses. Stations would be placed about four to five blocks apart along the sidewalk to facilitate right-hand side boarding from the streetcar. A detailed “best-lane analysis” of the lane configuration of the recommended alternative is included in the *Glendale Streetcar Design Report* (City of Glendale, 2021).

Figure 3-1. Route Alternatives



Source: HNTB, 2018

3.2. ROUTE ALIGNMENTS AND STATION LOCATIONS

This section describes the configuration of the proposed streetcar alignments in relation to existing roadway characteristics. Conceptual plans and proposed cross-sections for each alignment can be found in Appendix A.

Alternative 1 – Central/Brand Loop

Along Central Avenue, between San Fernando Road and Colorado Street, the existing roadway has two lanes in the northbound and southbound directions, a center turn lane, and parallel parking along the curb, as shown in **Figure 3-2**. Streetcars would use the right lane in both the northbound and southbound direction, adjacent to parallel parking. **Figure 3-3** illustrates a proposed cross-section of this section of Central Avenue.

Figure 3-2. Existing Cross-Section on Central Avenue, San Fernando Road to Colorado Street, Looking North

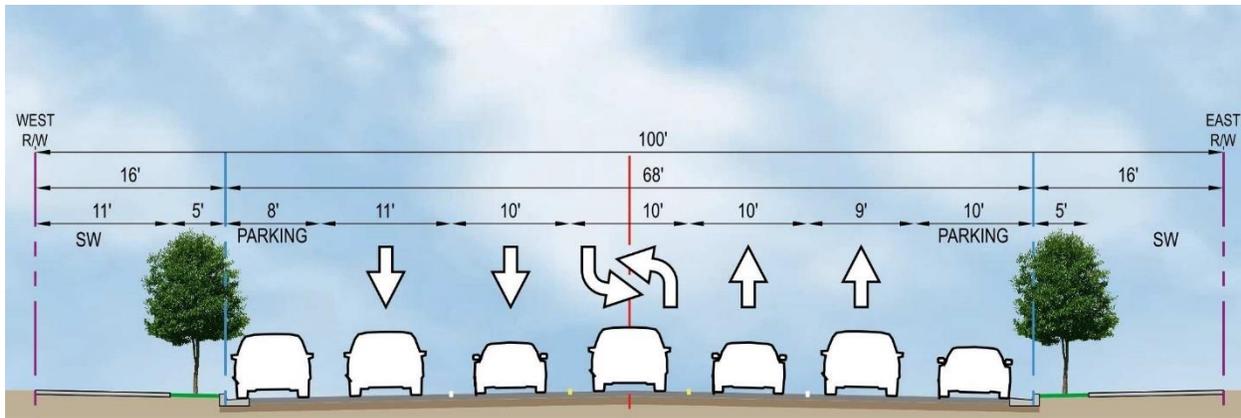
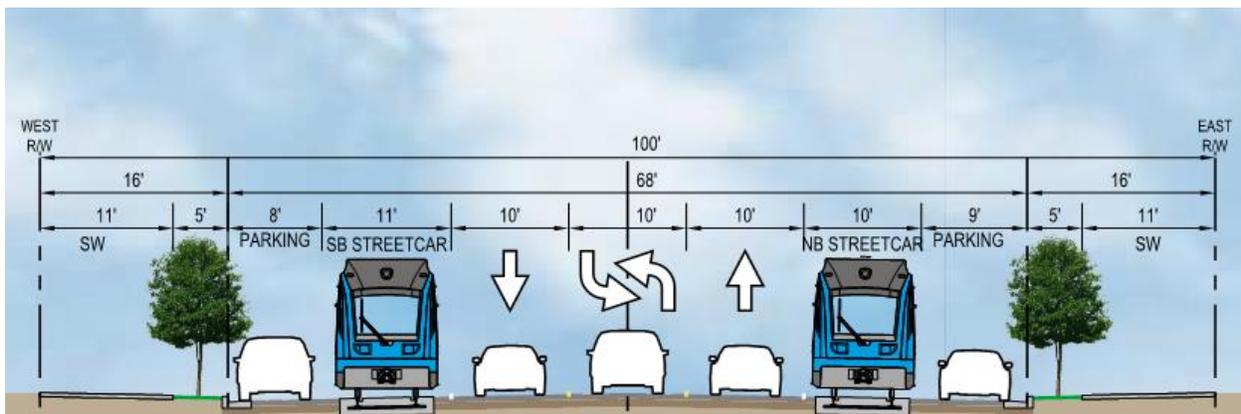


Figure 3-3. Alternative 1 Cross-Section on Central Avenue, San Fernando Road to Colorado Street, Looking North



The loop configuration begins at Colorado Street, with northbound running along Central Avenue and southbound along Brand Boulevard.

Central Avenue, between Colorado Street and Stocker Street, has two through lanes northbound with right-turn lanes and some parallel parking, as shown in **Figure 3-4**. The streetcar would use the right lane in the northbound direction adjacent to the parking lane. An overhead pedestrian bridge is located north of Galleria Way; streetcars would travel under this bridge without impact to the structure.

Figure 3-5 illustrates a cross-section of this proposed section of Central Avenue.

Figure 3-4. Existing Cross-Section on Central Avenue, Colorado Street to Stocker Street, Looking North

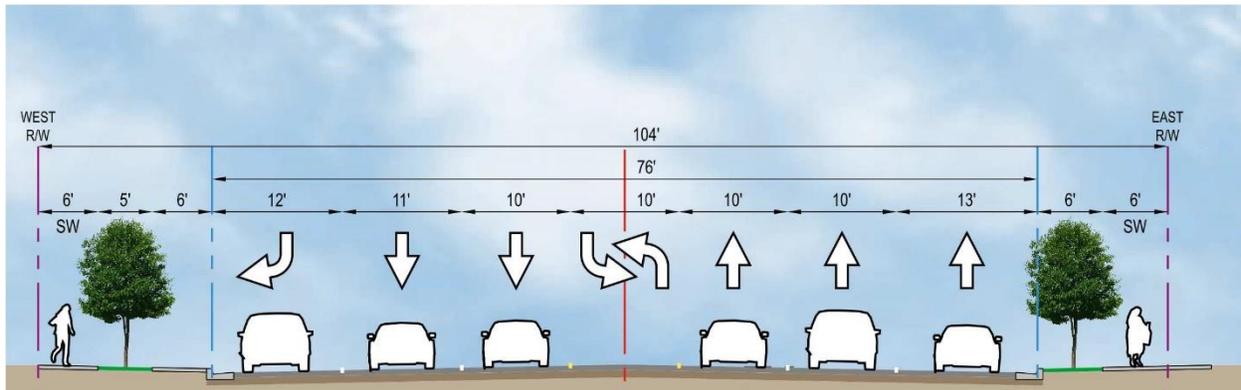
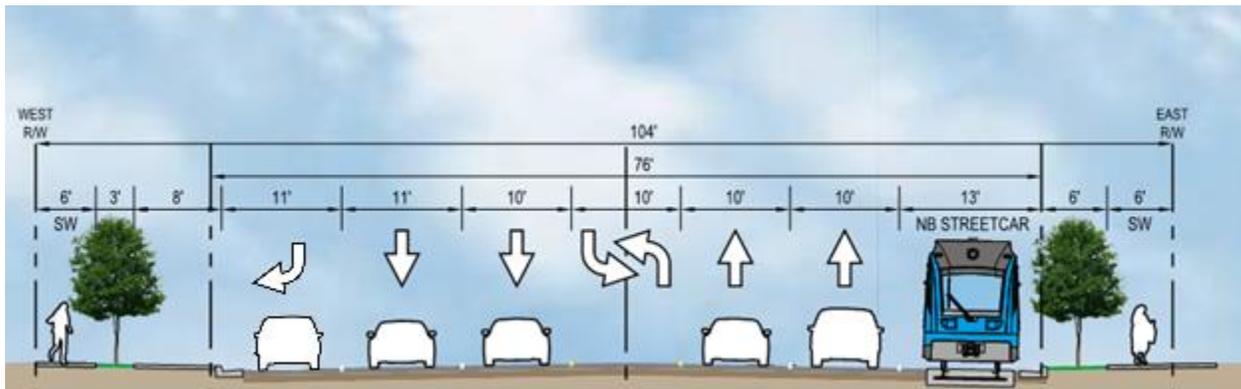


Figure 3-5. Alternative 1 Cross-Section on Central Avenue, Colorado Street to Stocker Street, Looking North



The loop would continue east on Stocker Street and head southbound on Brand Boulevard in the right lane. This section of Brand Boulevard has a mix of two and three through lanes in the southbound direction, with right turn lanes, and a mix of angled parking, parallel parking, valet parking lanes, and loading zones. A typical cross-section is shown in **Figure 3-6**. Signalized pedestrian crosswalks occur mid-block between signalized intersections.

Figure 3-7 illustrates this proposed section of Brand Boulevard.

Figure 3-6. Existing Cross-Section on Brand Boulevard, Colorado Street to Broadway, Looking North

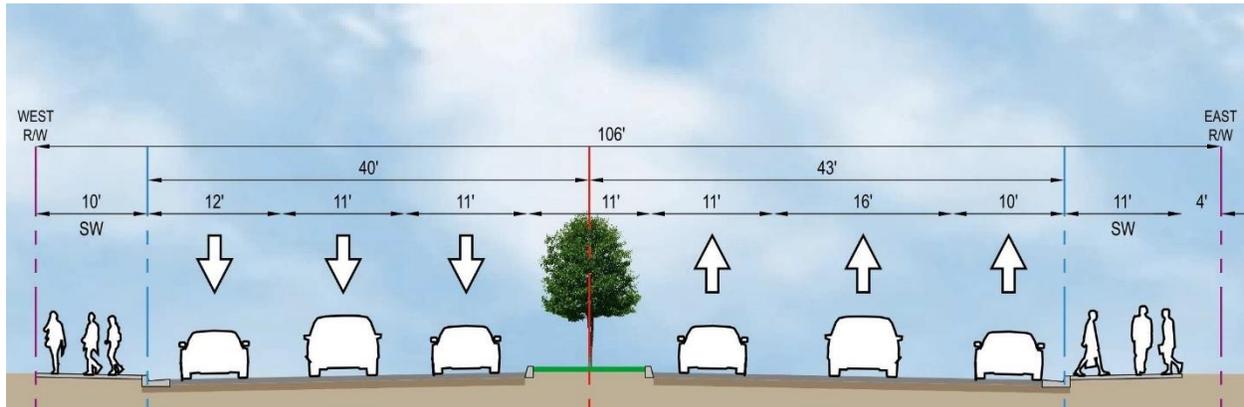
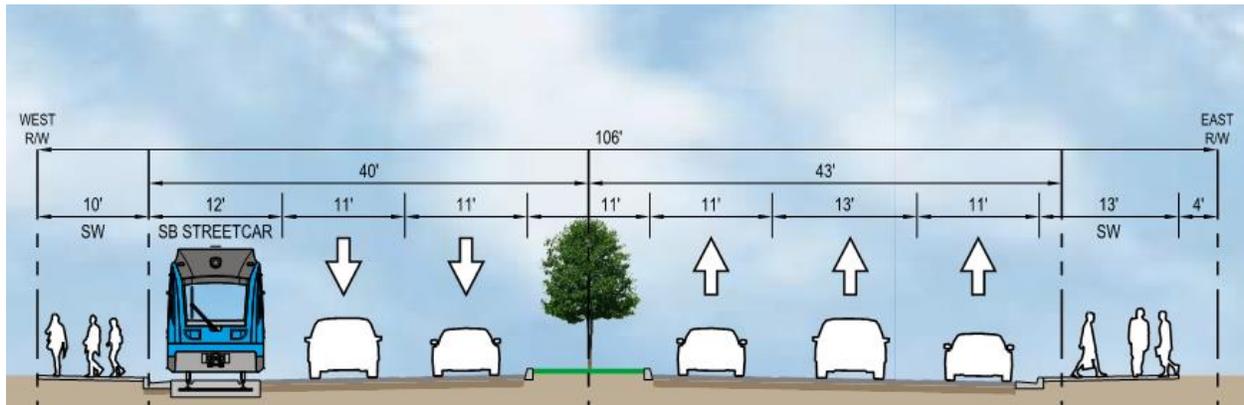


Figure 3-7. Alternative 1 Cross-Section on Brand Boulevard, Colorado Street to Broadway, Looking North



A school crossing with flashers is located at Fairview Avenue. This location would be evaluated for a traffic or warning signal. The route would be evaluated for the potential to add additional traffic signals to control cross traffic safely across the tracks in the next phase of design.

As shown on **Figure 3-1**, potential station locations for Alternative 1 include:

1. Glendale Transportation Center (terminus)
2. Central/San Fernando (northbound and southbound)
3. Central/Chevy Chase (northbound and southbound)
4. Central/Maple (northbound and southbound)
5. Central/Americana (northbound) and Brand/Americana (southbound), between Americana and Broadway on each street
6. Central/California (northbound) and Brand/California (southbound)
7. Central/Doran (northbound) and Brand/Doran (southbound)
8. Central/Arden (northbound) and Brand/Arden (southbound)
9. Stocker (Eastbound)

Station design and locations are discussed in **Section 3.3**. Both the design and locations of stations will be refined in future phases of design.

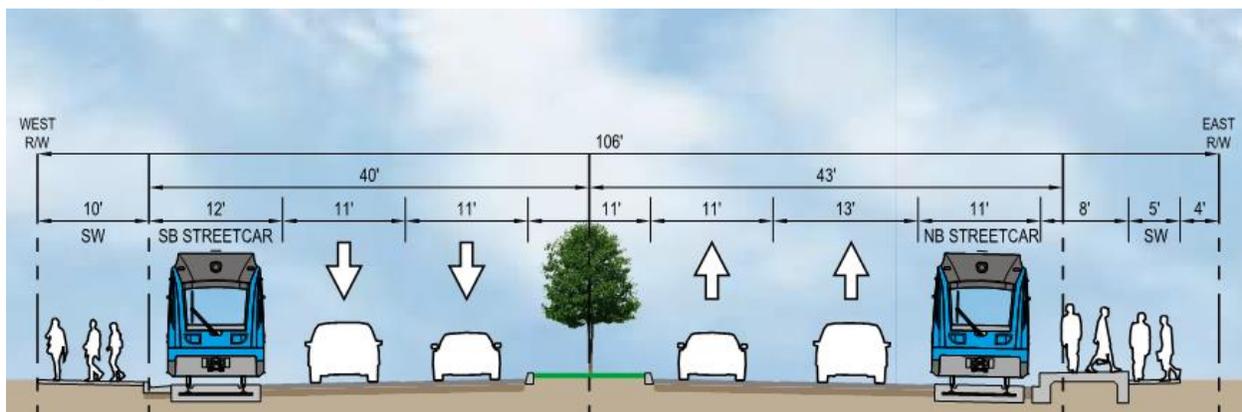
Alternative 2 – Central/Brand Two-Way

Alternative 2 would follow the same route on Central Avenue as Alternative 1 between the Glendale Transportation Center and Colorado Street with identical features and considerations along this section. Streetcars would use the right lane in both the northbound and southbound direction, adjacent to parallel parking. **Figure 3-2** illustrates a cross-section of this segment of Central Avenue.

The streetcar tracks would transition from Central Avenue to Brand Boulevard in the area between Maple Street and Colorado Street. If this alternative is selected, during future project study phases, the design for the streetcar will consider a variety of cross streets to connect from Central Avenue to Brand Boulevard, including Maple Street, Chestnut Street, Lomita Street, and Elk Avenue. The northbound and southbound tracks could also be split between two cross streets (e.g., northbound could use Maple Street to cross from Central Avenue to Brand Boulevard, and southbound could use Lomita Street to cross from Brand Boulevard to Central Avenue).

Once on Brand Boulevard, streetcars would use the right lane in both the northbound and southbound directions. This section of Brand Boulevard has a mix of two and three through lanes in each direction, left- and right-turn lanes, and a mix of angled parking, parallel parking, valet parking lanes, and loading zones. The travel lanes and parking/loading/valet lanes will be configured to maintain two lanes of traffic adjacent to the streetcar. Along Brand Boulevard, signalized pedestrian crosswalks occur mid-block between signalized intersections. The route would be evaluated for the potential to add additional traffic signals to control cross traffic safely across the tracks in the next phase of design. **Figure 3-8** illustrates a proposed cross-section of this segment of Brand Boulevard.

Figure 3-8. Alternative 2 Cross-Section on Brand Boulevard, Colorado Street to Broadway, Looking North



Source: HNTB, 2018

The streetcar tracks would cross SR-134 and continue north to a terminus just south of Stocker Street. Northbound streetcars would unload customers at a station platform, the operator

would switch cab ends, and the streetcar would pick up customers from the platform to begin its southbound trip.

As shown on **Figure 3-1**, potential station locations for Alternative 2 include:

1. Glendale Transportation Center (terminus)
2. Central/San Fernando (northbound and southbound)
3. Central/Chevy Chase (northbound and southbound)
4. Central/Maple (northbound and southbound)
5. Brand/Americana (northbound and southbound), between Americana and Broadway
6. Brand/California (northbound and southbound)
7. Brand/Doran (northbound and southbound)
8. Brand/Arden (northbound and southbound)
9. Brand/Stocker (terminus)

Station design and locations are discussed in **Section 3.3**. Both the design and locations of stations will be refined in future phases of design.

3.3. STATION DESIGN

This section provides an overview of streetcar stations, including station program elements, station placement criteria, and typical station layout. More detail about station design and placement is provided in the *Glendale Streetcar Design Report*.

Streetcar stations would be approximately 110 feet long with 70-foot level-boarding platforms with Americans with Disabilities Act (ADA) accessible ramps. Stations would provide shelters, seating, and real-time vehicle arrival displays. Depending on fare policy, stations could also include ticket vending machines or off-vehicle fare collection technology.

Station locations are generally spaced three to five blocks apart. Preliminary station locations were developed based on proximity to activity generators, convenience of transfers to connecting routes, and availability of right-of-way.

In areas where a bump-out is not feasible, station platforms will be integrated into the sidewalk as shown in **Figure 3-10**. The layouts will be refined for each station location during the next phase of design.

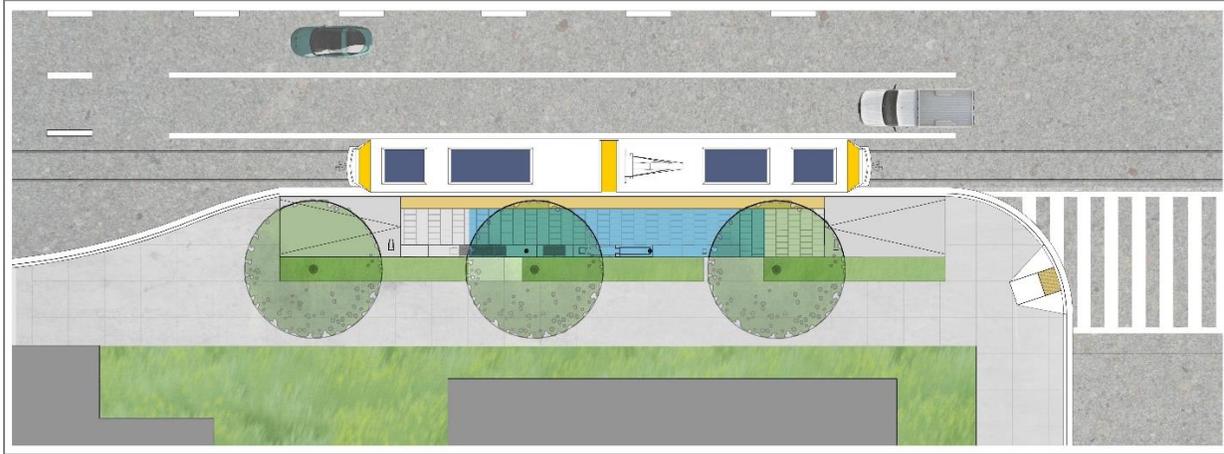
Figure 3-11, **Figure 3-12**, and **Figure 3-13** illustrate potential stations on Central Avenue near Laurel Street, on Brand Boulevard near Broadway, and on Brand Boulevard near California Avenue, respectively.

Figure 3-9 shows a typical station layout for a curbside “bump out” station, where the roadway width is sufficient to place the boarding platform adjacent to the existing sidewalk. Bump-outs also shorten the crossing distance for pedestrians who are crossing the street.

In areas where a bump-out is not feasible, station platforms will be integrated into the sidewalk as shown in **Figure 3-10**. The layouts will be refined for each station location during the next phase of design.

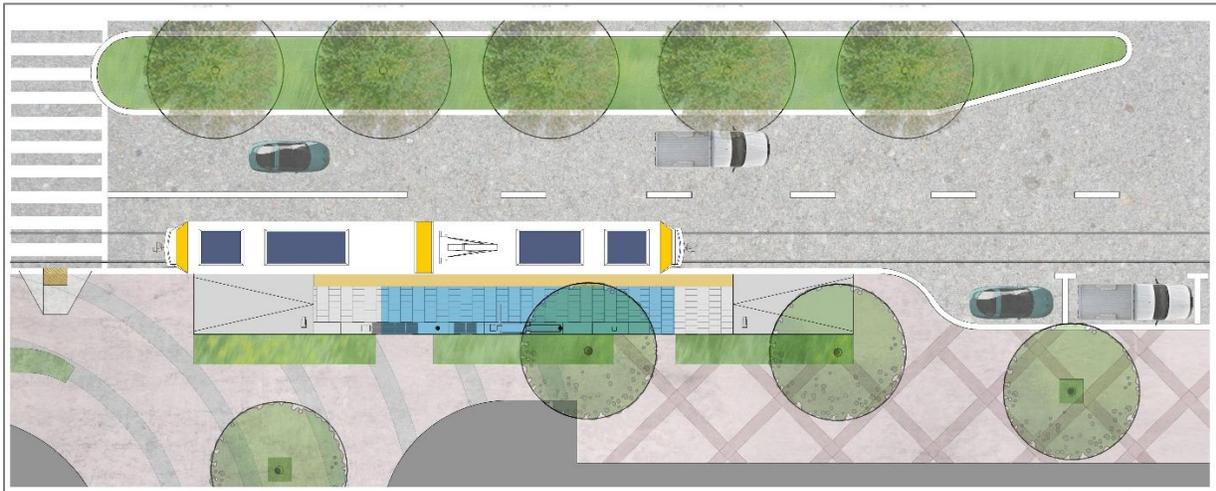
Figure 3-11, Figure 3-12, and Figure 3-13 illustrate potential stations on Central Avenue near Laurel Street, on Brand Boulevard near Broadway, and on Brand Boulevard near California Avenue, respectively.

Figure 3-9. Bump-Out Station – Typical Layout



Source: Studio MLA, 2020

Figure 3-10. Sidewalk Station – Typical Layout



Source: Studio MLA, 2020

Figure 3-11. Rendering of Potential Station on Central Avenue near Laurel Street



Source: Studio MLA, 2020

Figure 3-12. Rendering of Potential Station on Brand Boulevard near Broadway



Source: Studio MLA, 2020

Figure 3-13. Rendering of Potential Station on Brand Boulevard near California Avenue



Source: Studio MLA, 2020

3.4. ANCILLARY FACILITIES

3.4.1. Operations and Maintenance Facility

An operations and maintenance facility (OMF) will be required to provide overnight storage, maintenance, and operational control of the streetcars. This section details the basic elements of the OMF, discusses site selection criteria, and shows an OMF concept plan. More detail about OMF requirements is provided in the *Glendale Streetcar Design Report* (City of Glendale, 2021).

The OMF will handle inspection, servicing, maintenance, and repair activities to keep the streetcar vehicles in service. The OMF will include an enclosed building that contains maintenance bays and a vehicle wash bay. It will also contain an office area for administration and operations staff and maintenance support areas with shop/storage space. The yard for the OMF will contain track to access the site and storage tracks. **Figure 3-14** shows an examples of a streetcar OMFs in Seattle.

Figure 3-14. Seattle First Hill Streetcar Operations and Maintenance Facility



Source: HNTB, 2017

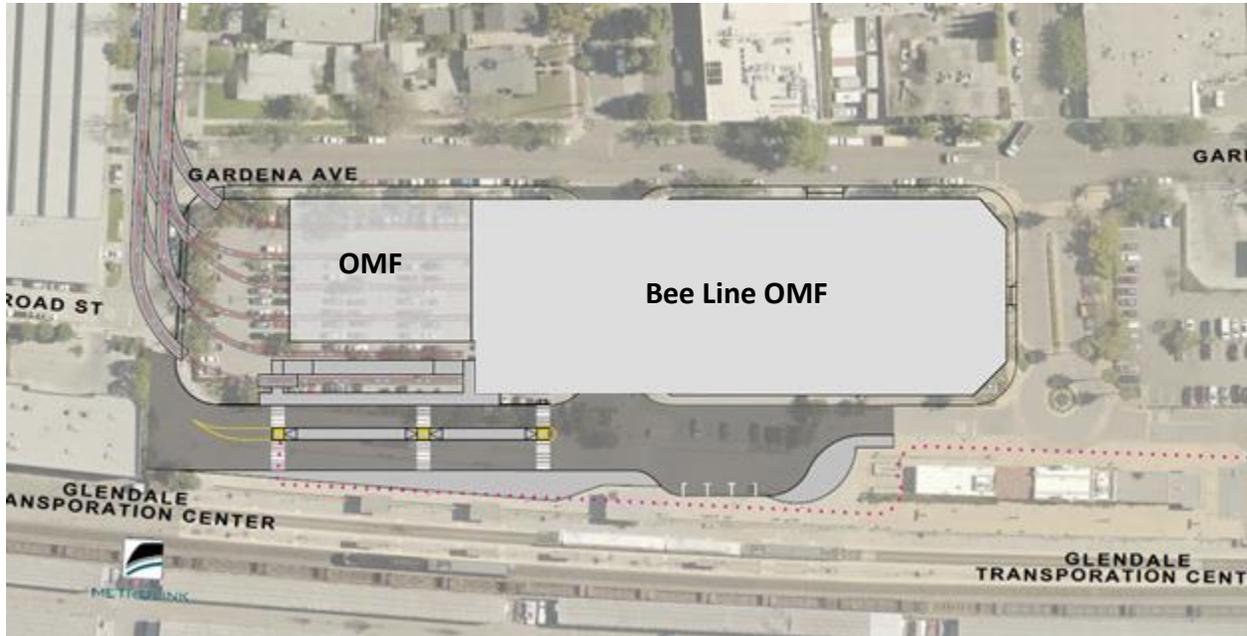
This study considered an OMF location near the Glendale Transportation Center at the southern terminus of the route, adjacent to the recently constructed Beeline OMF. Subsequent project phases may consider other site options when the site requirements can be established with greater specificity after more detailed project design phases. A site near the streetcar route is required to accommodate the OMF program elements. The following factors are important to the site identification and evaluation process:

- **Non-revenue track:** The OMF should be near the streetcar route to minimize the amount of non-revenue track that would need to be constructed. Ideally the OMF site should be within one block of the route and no more than four blocks from the route.
- **Access:** The site needs to be accessible to the streetcar and other potential users.
- **Size:** The site should be approximately two acres to accommodate the OMF program elements.
- **Use compatibility:** The OMF should be compatible with surrounding land use and development patterns. Sites located on publicly owned property and/or private property that is underutilized should be given preference for OMF siting.

Figure 3-15 shows an OMF concept at a potential site located next to the GTC. The site is on an existing city-owned surface parking lot and private property that may need to be acquired. This site is conceptual at this time and more detailed design phases for the project will examine this

and other potential sites in greater detail. The conceptual OMF layout at this potential site shows four indoor bays and two outside storage tracks along with associated offices and other operations uses.

Figure 3-15. Conceptual OMF Layout at Glendale Transportation Center



Source: HNTB, 2021

3.4.2. Traction Electrification System

A Traction Electrification System (TES) is required to provide power to the streetcar vehicle. The main components of the TES are traction power substations (TPSSs) and the overhead contact system (OCS). The function of the TPSSs is to convert the alternating current provided by the electric utility company to the correct voltage of direct current required by the streetcar vehicle. Each TPSS typically has a footprint of about 5,000 square feet, including space for maintenance and vehicular access. Multiple TPSS locations would be required, spaced roughly evenly over the length of the streetcar alignment. The location and spacing of the TPSSs will be determined during a future phase of design.

The OCS consists of overhead wires along the length of the streetcar alignment and related support structures. The purpose of the OCS is to transmit electrical power from the TPSSs to the streetcar vehicle.

Technology is advancing to support partial or complete “off-wire” operations of streetcar vehicles. In areas where the streetcar operates off-wire, the OCS is eliminated, and power is provided instead from an on-board storage energy storage system (ESS), either lithium-ion batteries or supercapacitors. Streetcar systems in Milwaukee, Detroit, and Oklahoma City are examples of off-wire operations using a lithium-ion battery ESS.

3.5. VEHICLES AND TECHNOLOGY

A range of streetcar vehicle designs are available from manufacturers in the United States and around the world. **Table 3-1** presents a comparison of the characteristics of several of the vehicles commonly used in the United States, and as shown, the primary differences among the vehicles from the perspective of the rider are the length of the vehicle and the resulting passenger capacity. All of the vehicles support off-wire operations.

Table 3-1. Streetcar Vehicles and their Key Characteristic

Characteristic	CAF Urbos 70	Siemens S-70	Brookville Liberty
Width	8 feet, 8 inches	8 feet, 8 inches	8 feet, 8 inches
Length	59 feet, 1 inch	85 feet, 3 inches	66 feet, 5 inches
Capacity (passengers)	162	195	113
Minimum turn radius	59 feet	59 feet	59 feet
Low floor carriage	70% -100%	70%	70%
Low floor doors	All	All	All
Weight	76,850 pounds	96,500 pounds	83,200 pounds
Max Speed	42 miles per hour	35 miles per hour	48 miles per hour
Height	13 feet	12.6 feet	11 feet

Source: Vehicle Manufacturers, 2020

3.6. PRELIMINARY OPERATIONS PLAN

This section presents a preliminary operations plan for the streetcar that was developed to understand travel times, operating hours, and operating costs for each of the route alternatives. The analysis utilizes planning-level estimates to develop operating assumptions for this feasibility study phase. Future project phases will examine travel times and streetcar operating schedules in more detail to confirm the operating plan for the streetcar.

3.6.1. Travel Times

A planning-level travel time model was developed to determine the approximate round-trip travel times for the streetcar and its route alternatives. Data inputs for the model include the roadway speed limits, traffic signal locations, streetcar turning movements, stop locations, and existing traffic patterns. The travel speed, signal data, and stops were input into the model to determine the travel time.

Then, the estimated travel time was compared to actual drive times using Google Traffic as a means of grounding the estimates. Travel speeds for both the streetcar and autos were reduced when necessary and signal delay increased where significant delays were present to adjust for actual conditions.

The travel times developed for the streetcar route alternatives are summarized in **Table 3-2** for three different scenarios: AM Peak, PM Peak, and Off-Peak. The AM and PM peak periods

represent times when Google Maps indicated the most congestion was present during these peak periods in the project area.

Table 3-2. Estimated Travel Times

Route Alternative	Round Trip Travel Time (mins.)		
	AM Peak	PM Peak	Off-peak
Alternative 1: Central/Brand Loop	44	50	38
Alternative 2: Brand Two-Way	44	51	35

The travel times analysis in **Table 3-2** shows both route alternatives have similar round-trip travel times during the AM Peak (44 minutes) and PM Peak (50 and 51 minutes) periods. The slightly faster travel time for Alternative 1 is primarily driven by faster speeds and less congestion on Central Avenue north of Lomita Avenue compared to the same section of Brand Boulevard. The off-peak travel times show a slight difference between the alternatives. Alternative 2 has the faster off-peak round-trip travel time at 35 minutes versus 38 minutes for Alternative 1. This is likely due to the directness of the Alternative 2 route because it has fewer turning movements. Also, Brand Boulevard has less congestion during the off-peak periods. The potential differences in travel times at this phase of study are within the margin of error and future study phases will analyze travel times in more detail.

The loop configuration of Alternative 1 may result in longer passenger travel times for some trips that are not quantified in the model. For example, a passenger boarding at the GTC and traveling to California Avenue/Brand Boulevard can either travel on the streetcar to California Avenue/Central Avenue station, disembark and walk east to Brand Boulevard; or travel on the streetcar north to Stocker Street and travel south back down to California Avenue/Brand Boulevard. **Table 3-3** details the different travel scenarios for that trip, highlighting the inefficiency of the loop in some circumstances. A passenger unfamiliar with the system would likely ride the streetcar loop until it directly serves California Avenue/Brand Boulevard, which would add 13-15 minutes onto their trip.

Table 3-3. Travel Scenarios - GTC to California Avenue/Brand Boulevard

Travel Sequence	Travel Time (minutes)
Alternative 1: Central/Brand Loop – Board at GTC and ride to California/Brand stop taking the loop	30
Alternative 1: Central/Brand Loop – Board at GTC, ride to California/Central stop, and walk to California/Brand avoiding the loop	16
Alternative 2: Brand Two-Way – Board at GTC and ride directly to California/Brand	14

3.6.2. Service Assumptions

As discussed in **Section 1.3. Streetcar Overview**, streetcars are meant for relatively short intraurban trips that circulate people throughout downtown and between neighborhood districts and destinations. Streetcars serve some work-related trips but are most popular throughout the day and during the weekends for shopping, dining, entertainment, and other personal travel needs. As a result, streetcars require high-frequency service throughout most of the day and into the early evening. High-frequency service has the added benefit that it allows passenger to use the system without the need to consult a time schedule.

Table 3-4 shows the preliminary operating schedule. The schedule is based on the anticipated travel patterns in the Glendale Streetcar study area and best practices from other streetcar systems operating in the United States. The schedule assumes operating hours are 6:00 a.m. to midnight during weekdays with slightly shortened operating hours on Sundays. Peak headways of 10 minutes are recommended during weekdays from 7:00 a.m. to 7:00 p.m. and for most of Saturday and Sunday. Outside of peak periods, 20-minute headways should be maintained to provide adequate service for less typical trips.

Table 3-4. Operating Schedule

Days	Period	Start	End	Headway (minutes)
Weekdays (Monday – Friday)	Early AM	6:00 a.m.	7:00 a.m.	20
	Peak	7:00 a.m.	7:00 p.m.	10
	Night	7:00 p.m.	12:00 a.m.	20
Saturday	Early AM	7:00 a.m.	10:00 a.m.	20
	Peak	10:00 a.m.	7:00 p.m.	10
	Night	7:00 p.m.	12:00 a.m.	20
Sunday	Early AM	8:00 a.m.	12:00 p.m.	20
	Peak	12:00 p.m.	6:00 p.m.	10
	Night	6:00 p.m.	9:00 p.m.	20

3.7. FARE POLICY

Transit fares are an important source of operating funds for streetcars and other transit systems in the United States. Determining a fare policy is an important component of the Glendale Streetcar system that must balance revenue needs with ridership to best fit the goals of the system. Fare policies can be designed to maximize farebox recovery, maximize ridership, or to find a balance between the two.

To maximize ridership, some systems have implemented “no fare” policies and forego passenger farebox revenue entirely. “No fare” policies decrease barriers to ride since no purchase is necessary. This makes the system easier to use and encourages people to use the system more frequently. Also, “no fare” systems can save money on infrastructure and

maintenance since they do not need to install ticket vending machines. In addition, administrative costs may be lower since “no fare” systems do not have to conduct ticket enforcement. However, “no fare” systems do not collect farebox revenue, which is often an important source of revenue for transit systems. “No fare” systems must have another stable source of funds that can accommodate annual operating costs such as tax revenue, advertising, naming rights, and other funding mechanisms.

As shown in **Table 3-5**, some streetcar systems currently have “no fare” policies including Milwaukee, WI; Tacoma, WA; Kansas City, MO; Dallas, TX; and Washington D.C. Three of these “no fare” systems (Milwaukee, Tacoma, and Dallas) have indicated they have plans to begin charging in the next 1 to 2 years. Many other systems have determined that fares in the \$1 to \$2 range provide an adequate balance between revenue and ridership including Seattle, WA; Tucson, AZ; Atlanta, GA; Portland, OR; Cincinnati, OH; and Detroit, MI. Both the Atlanta Streetcar and QLINE in Detroit started with a free introductory period before transitioning to their current fares.

Table 3-5. Example Fare Systems

System Name	Current Fare	Fare Collection Mechanism	Integration with Regional Transit
The Hop	Free	N/A	N/A
Tacoma Link	Free	N/A	N/A
KC Streetcar	Free	N/A	N/A
Dallas Streetcar	Free	N/A	N/A
Washington D.C. Streetcar	Free	N/A	N/A
Seattle Streetcar	\$2.25	Off-board purchase; random proof of payment required on board	Regional transit card accepted for payment at platforms. Transfers accepted.
Tucson Sun Link	\$1.50	Off-board purchase; validate on-board at machine	Part of regional Sun Tran fare system
Atlanta Streetcar	\$1.00	Off-board purchase; present receipt when boarding	Operated by MARTA, no free/reduced transfers from MARTA
Portland Streetcar	\$2.00	Off-board and on-board purchase; random proof of payment required on board	Free transfers from Tri-County Metropolitan Transportation District of Oregon (TriMet) services
Cincinnati Bell Connector	\$1.00	Off-board purchase; random proof of payment required on board	Free transfers from Metro services

System Name	Current Fare	Fare Collection Mechanism	Integration with Regional Transit
QLINE Detroit	\$1.50	Off-board purchase; random proof of payment required on board	\$0.25 transfer to Detroit DOT and SMART bus services

KC Streetcar = Kansas City

MARTA = Metropolitans Atlanta Rapid Transit Authority

The Hop = Milwaukee Streetcar

In addition to farebox revenue, streetcar systems use several other sources to help fund operations, including sponsorship, federal funding, regional funding, and grants. During future phases, fare policies and operating funding sources for the Glendale Streetcar will be further developed and refined. No decisions have been made on fare policy for the Glendale Streetcar, but a fare-free system should be considered, especially in the early operating periods to help encourage habit formation and allow potential riders to discover the service.

4. EVALUATION OF PRELIMINARY ALTERNATIVES

The following sections evaluate the two route alternatives based on a range of factors to test the feasibility and functionality of the routes and to identify the advantages and disadvantages of each of the route alternatives.

4.1.1. Activity Generators

Table 4-1 and **Figure 4-1** through **Figure 4-4** provide a summary of activity generators adjacent to the streetcar route alternatives including major destinations, residential units, commercial square feet, and transit users.

Table 4-1. Activity Generators

Activity Generator*	Alternative 1 – Central/Brand Loop	Alternative 2 – Central/Brand Two-Way
Major Destinations**	9	10
Residential Units	579	281
Commercial Square Feet	6,211,682	8,158,044
Daily Transit Users	3,537	3,921

Sources: Google Maps, 2018. Glendale Parcel Data, 2018. Metro Transit Ridership, 2018. Glendale Beeline Ridership, 2014.

* The data only reflects locations that are directly adjacent to the streetcar route. This means if the streetcar is only traveling northbound, only data points on the east side of the street were inventoried.

**Major destinations include cultural and entertainment attractions, shopping destinations, and hotels

Alternative 1 – Central/Brand Loop

Alternative 1 is directly adjacent to several activity generators on the east side of Central Avenue and the west side of Brand Boulevard in the downtown area and along Central Avenue to the south of downtown. Alternative 1 is adjacent to nine major destinations including Glendale Galleria, Americana at Brand, several hotels, and the Glendale Memorial Hospital. The loop alternative is adjacent to a relatively high number of residential units (579), which is driven by several new multi-story residential developments along the east side of Central Avenue in the downtown area. The southbound route along the west side of Brand Boulevard is adjacent to a dense commercial district in downtown and adjacent to commercial uses along Central Avenue to the south of downtown totaling over 6.2 million square feet of commercial space. Alternative 1 is adjacent to transit stops used by more than 3,500 current daily transit users.

Alternative 2 – Central/Brand Two-Way

Alternative 2 directly serves both sides of Brand Boulevard, downtown’s major thoroughfare, and both sides of Central Avenue to the south of downtown. Alternative 2 is adjacent to 10 major destinations including the Americana at Brand, Alex Theatre, several hotels, and the Glendale Memorial Hospital. Alternative 2 serves Glendale’s premier downtown office district and is adjacent to nearly 8.2 million square feet of commercial space. Alternative 2 is adjacent to only 281 residential units since the current mix of uses along this corridor is primarily retail and office uses. Alternative 2 is adjacent to transit stops used by more than 3,900 current daily transit users.

Figure 4-1. Districts and Destinations

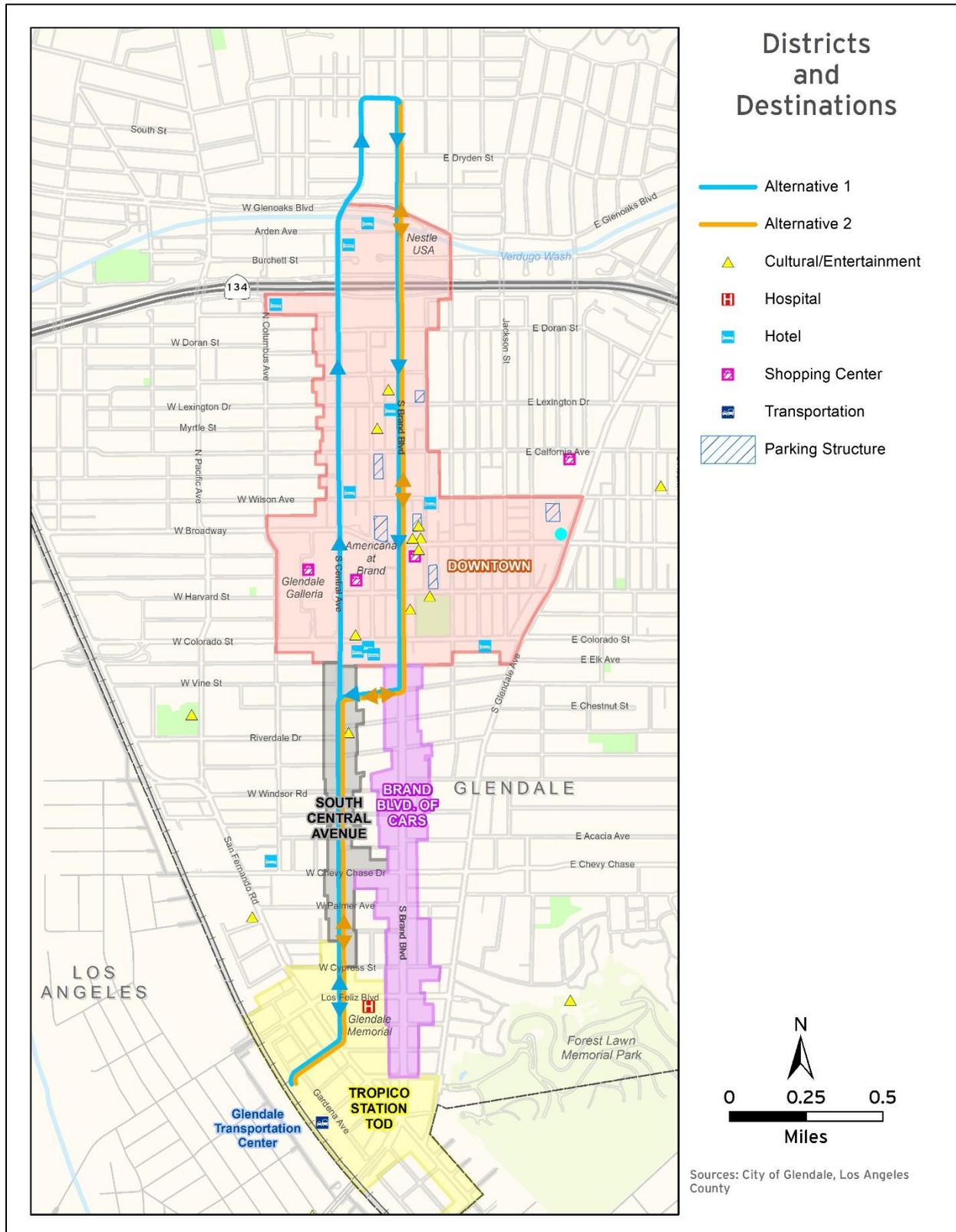


Figure 4-2. Housing Units

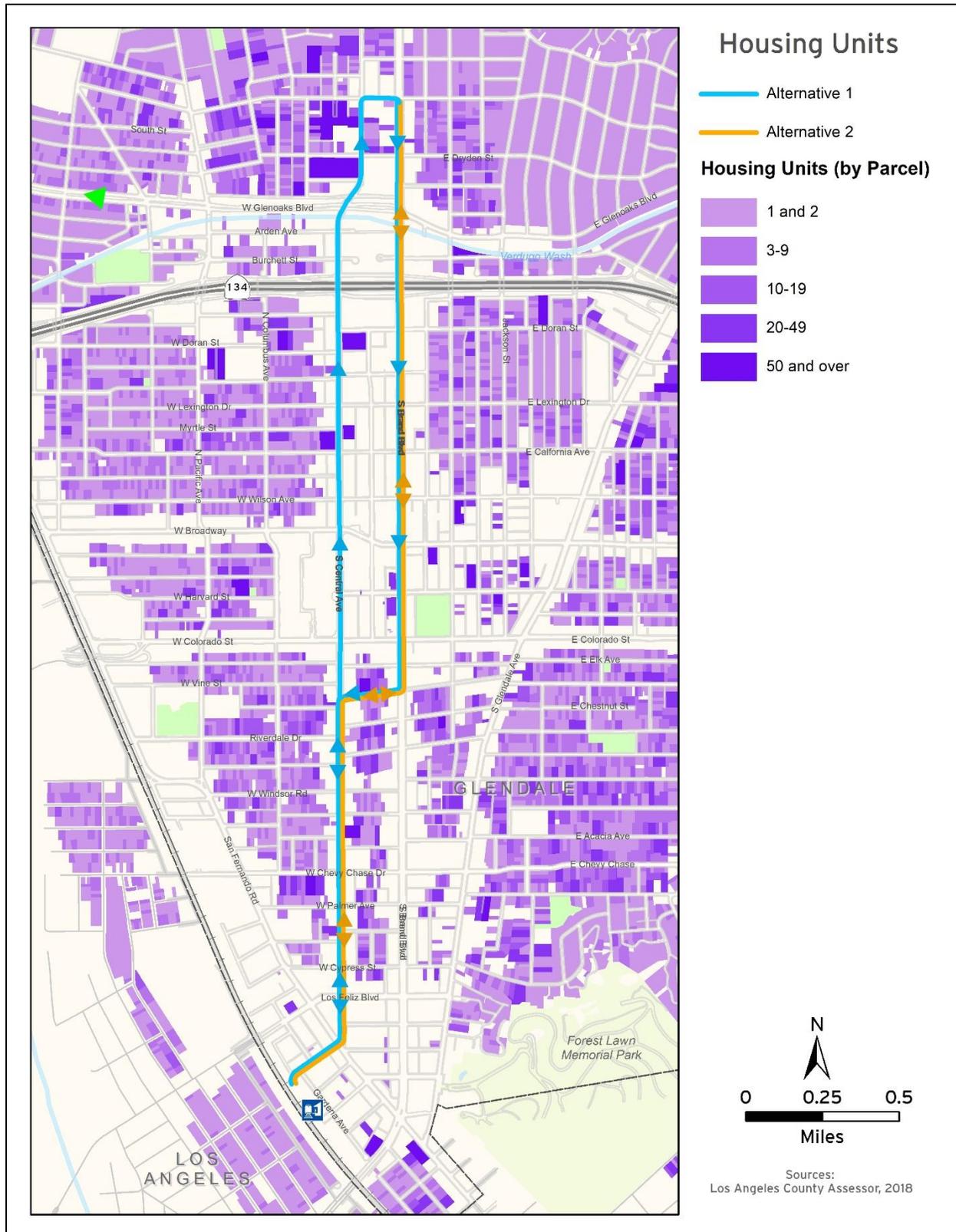


Figure 4-3. Commercial Square Feet

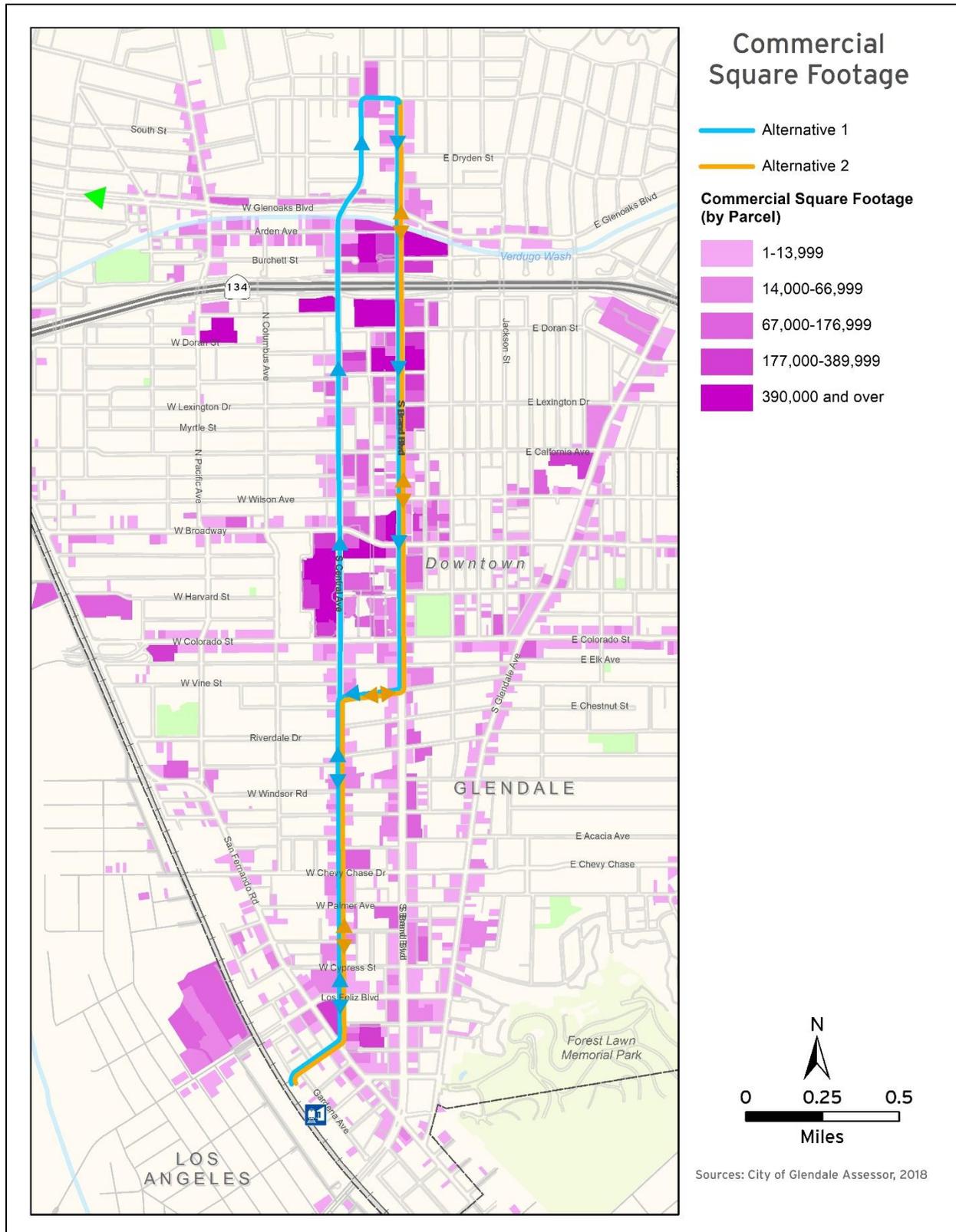
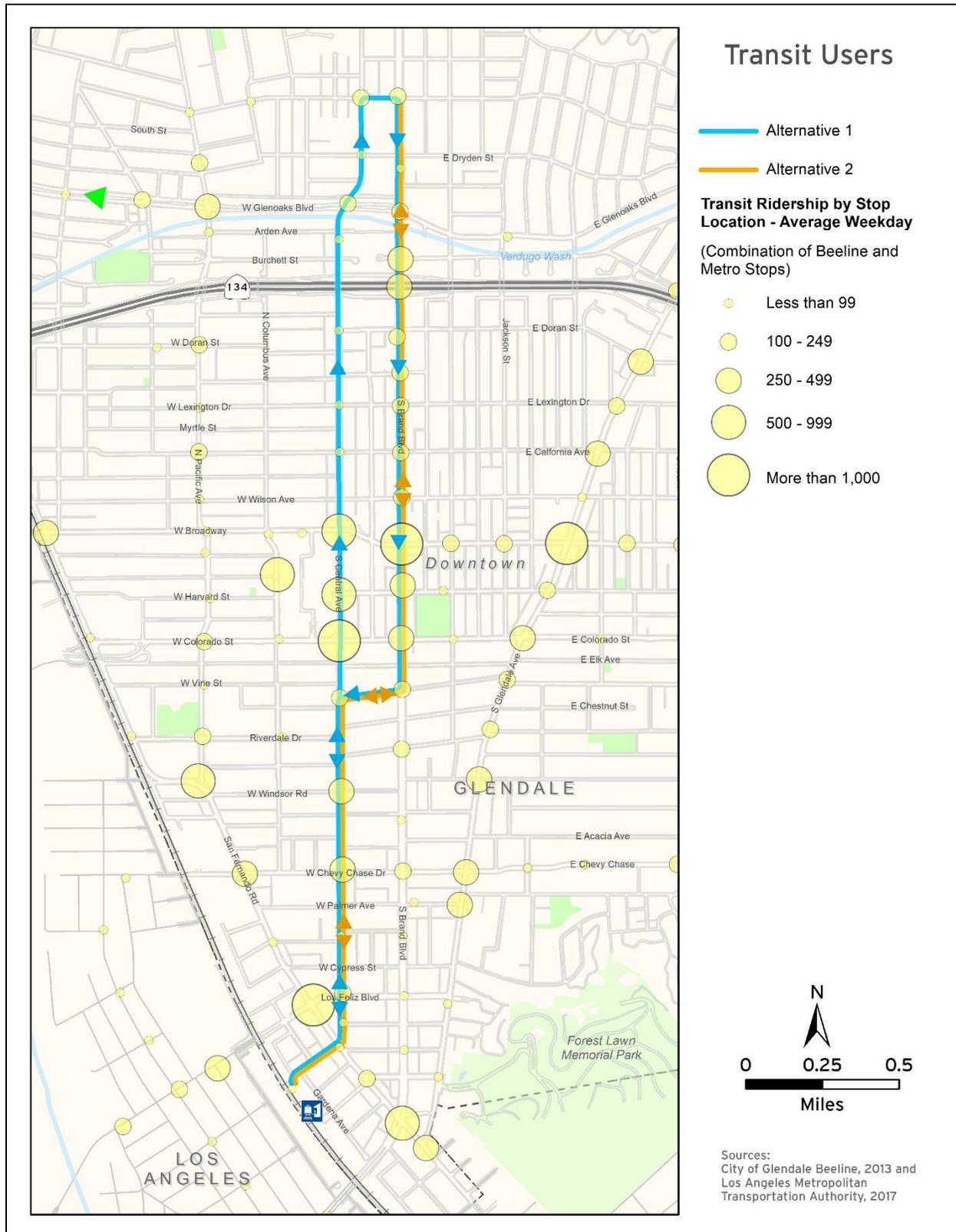


Figure 4-4. Transit Users



4.1.2. Ridership

A preliminary planning-level ridership estimate was developed for the Glendale Streetcar route alternatives to assist in the decision-making process for the feasibility study phase. For this phase, the estimates are conservative and do not represent a final ridership estimate. The models and estimates have difficulty between the two route alternatives in downtown due to their similarity and proximity. Alternative 1 may potentially see lower ridership as a factor of rider confusion of the loop route concept as noted above. As the project progresses, a more detailed ridership estimate will be prepared to narrow the range of daily riders and determine differences between the alternatives.

The planning level estimate described below was developed using the following two models to obtain a range of potential ridership estimates.

Corridor Growth Model

This model represents a conservative estimate based on the current project planning and design progress. This approach utilizes bus ridership elasticities for travel time, frequency, and increased visibility of a streetcar system to grow the existing Beeline bus ridership in the corridor based on streetcar service improvements. The elasticities are the results of peer-reviewed transit ridership research. This model does not account for growth in existing Metro trips or walk-trips that could utilize the streetcar service. Utilizing this model, a reasonable and conservative estimate for ridership on the proposed Glendale Streetcar is 1,400 to 1,800 riders daily for Alternative 1 and 1,500 to 2,000 riders daily for Alternative 2.

Case Study Model

This represents a high-end estimate based on other streetcar cities to help illustrate ridership potential based on future design and operations decisions such as dedicated-lanes, headways, fares, and hours of operations. To better understand the ridership potential of a streetcar system, this approach examines other streetcar systems in the United States that provide a similar service circulating people through a dense downtown environment. Case study cities include Tacoma, WA; Kansas City, KS; Milwaukee, WI; Cincinnati, OH; Detroit, MI; and Atlanta, GA. These systems all provide downtown circulators and represent a mix of different fares and operational characteristics. Data utilized from these case studies includes current ridership data from each city, including a comparison of free and transit fare systems. Each city's ridership data was compared to the route mileage to create an average ridership per route mile that was then applied to Glendale's potential route. The case study model indicates that both alternatives have the potential for up to 4,000 daily riders if features and operations were designed to maximize ridership, including free riders/no fares.

4.1.3. Economic Development

Based on the experiences of other streetcar cities, the increased mobility and accessibility from fixed-rail transit can help local communities facilitate economic development and achieve TOD goals. Like other cities, the Glendale Streetcar has the potential to spur economic development along its route since several complementary factors are present in the study area including Glendale’s land use and development policies that support mixed-use and walkable environments, favorable market conditions based on recent development trends, and land that could be redeveloped with higher density uses per development regulations.

The following sections discuss the economic development potential of the route alternatives in more detail.

Alternative 1 – Central/Brand Loop

A benefit of the loop alternative is how it can spread economic development opportunities to more than one corridor since it serves a larger geographic area, although the benefit is somewhat diminished since the station pairs are split between two different corridors. This may help facilitate additional higher density mixed-use development along Central Avenue in the downtown area consistent with the SGCP (City of Glendale, 2018). The presence of the streetcar along Central Avenue could help sustain many new developments that have occurred since 2013 and encourage additional investment along this corridor (see **Figure 2-5**). Based on land use plans and analysis, Central Avenue appears to have additional redevelopment capacity. Further study would be needed to explore specific economic opportunities.

Alternative 2 – Central/Brand Two-Way

Alternative 2 would concentrate the streetcar’s economic development potential along Brand Boulevard and help the City of Glendale achieve its land use and transportation goals for the downtown area in accordance with the SGCP and the *Downtown Specific Plan* (City of Glendale, 2019). This alternative has numerous built-in assets because it serves as the heart of the downtown activity zone; is adjacent to various cultural and entertainment uses; and has a high concentration of commercial square footage. Local plans promote the continuation of corporate headquarters and the development of mixed-use and residential buildings and street-level service and retail businesses to enhance the current character of the Brand Boulevard corridor. Redevelopment and/or a change in character along Brand Boulevard should be consistent with local plans. Brand Boulevard is a thriving, active commercial corridor with a unique character. By improving transit service with the addition of a streetcar, it will support the existing uses and help facilitate new higher density uses in accordance with local plans and development regulations.

Development Impacts within 0.25 mile of the Portland Streetcar (1998-2015)

- \$4.5 billion in new development
- Increase in market value of \$11.6 billion
- 7.7 million SF of commercial space
- 17,888 multi-family housing units

Source: Streetcar Real Estate Development Effects for Portland Streetcar, ECONorthwest

4.1.4. Transportation Connectivity

Linking the streetcar with other transportation modes improves mobility and decreases reliance on automobiles. Both alternatives would connect Beeline and Metro bus routes with Glendale's existing pedestrian and bicycle network. In addition, both route alternatives connect to the GTC where several public transportation systems including Amtrak, Metrolink, Greyhound, Metro, and Beeline have transfer points.

The following sections discuss the transportation linkages for each route alternative in greater detail.

Alternative 1 – Central/Brand Loop

Alternative 1 would connect to other transportation modes along both Brand Boulevard and Central Avenue. The alternative route is along existing Beeline bus routes and it would connect to Metro bus routes 180 along Central Avenue south of Broadway and Metro route 92 along the entirety of Brand Boulevard. Also, the loop alternative would overlap with the planned Metro North Hollywood to Pasadena BRT project, which could travel along Central Avenue in Glendale. The streetcar and BRT could potentially share the same lane and station locations along Central Avenue. However, the streetcar alignment may interfere with the proposed BRT route on Central Avenue as streetcar service, which has shorter trips and stops more frequently, may slow down BRT. Additionally, the existing on-street bike lanes along Central Avenue may conflict with the streetcar and may need to be relocated to an adjacent corridor for safety purposes. Pedestrian connectivity is available along both Brand Boulevard and Central Avenue through the existing sidewalk network.

Alternative 2 – Central/Brand Two-Way

Alternative 2 would connect to other transportation modes along Brand Boulevard. The alternative route is along an existing Beeline bus route and it would connect with Metro bus routes 180 at the intersection of Broadway and Brand Boulevard. Also, Metro local route 92 follows the alternative along Brand Boulevard to Glenoaks Boulevard. This alternative avoids conflict with the proposed BRT service on Central Avenue, while providing connection to BRT at Broadway and Brand Boulevard. Alternative 2, with both northbound and southbound tracks, would strongly reinforce Brand Boulevard's role as a multimodal and transit-focused corridor in accordance with the SGCP. The streetcar would complement this active pedestrian corridor that has an extensive sidewalk network.

4.1.5. User Experience

User experience can be a key determinant in the success of a new transit project and attracting riders.

Alternative 1 – Central/Brand Loop

Alternative 1 would run in a loop configuration in the downtown area and have the greatest geographical coverage. The loop configuration tends to be less intuitive to unfamiliar transit users because service is spread over a larger area with the streetcar only travelling in one direction and station pairs are split between two different streets, thus not immediately visible. The two-block spread between the northbound and southbound alignments is relatively

manageable, but this spread could cause confusion for users trying to determine where to get on and off the streetcar route. In addition, the loop configuration would require out of direction travel or a longer walking distance to board and alight at the same location. This could result in longer passenger travel times for some trips and lead to customer dissatisfaction with the system in general, which could result in the potential loss of riders. See **Section 3.6.1** for more information.

Alternative 2 – Central/Brand Two-Way

Alternative 2 would operate in a two-way configuration on Brand Boulevard in the downtown area and in a two-way configuration along Central Avenue to the south of downtown. Alternative 2 is the most direct route making it the easiest to understand for transit users with all station pairs on the same street. This allows riders and new users to get on and off in the same general area creating fewer barriers to ride, making it more predictable, and less out of direction travel.

4.1.6. Utilities

A preliminary review of below-ground utilities was conducted to identify any major conflicts with the streetcar alternatives. Some utilities would interfere with excavation work required for the construction of the streetcar, including installation of the track bed, potential overhead pole foundations, and station platforms. Depending on their locations and depth of cover, utilities that cross and run parallel to streetcar project elements may need to be relocated or otherwise protected in place (e.g., casing, or cathodic protection).

Above-ground utilities include some overhead electric and communications lines crossing Central Avenue and Brand Boulevard at intersections and along the north side of Stocker Street. No above-ground utilities present difficulty to streetcar implementation.

Alternative 1 – Central/Brand Loop

Two very large storm drains (81" and 114" diameter) lie beneath Central Avenue between San Fernando Road and Colorado Street. Subsequent project phases will study the effects of the streetcar's weight and vibrations on these pipes. The system would be designed to minimize disruption to these pipes. Other utilities are minor in nature and will be studied in the next phase of engineering design.

Alternative 2 – Central/Brand Two-Way

Other than the two large storm drains described above, an initial scan of utility records indicates no large or significant utilities within the proposed streetcar track envelope on Brand Boulevard. Other utilities are minor in nature and will be studied in the next phase of engineering design.

The streetcar design will maintain access to the storm drains and all other utilities along the corridor for both alternatives.

4.1.7. Traffic Impacts

Potential impacts to traffic and parking along the proposed corridors were assessed for both alternatives. Based on the alignments of the alternatives, the movements (i.e., left turn, right

turn, or through) that the streetcar would make at each intersection along the route were identified. In addition, intersections that would be located near stations were identified. Existing weekday AM and PM peak period traffic volumes were obtained from the *South Glendale Community Plan Final Program Environmental Impact Report* (City of Glendale, 2018) for 16 key intersections.

In general, traffic operations would not be substantially affected at intersections at which the streetcar makes a through movement, as it would cross the intersection at the same time as other vehicles traveling in the same direction. Opportunities to improve and potentially mitigate any mobility impacts can be addressed through signal timing modifications and the addition of transit-preferential treatments. Both strategies can provide improved mobility for through vehicles along the corridor.

The northbound and southbound directions along Central Avenue and Brand Avenue are the primary traffic movements. Signal timing strategies can include progression for these vehicular movements, minimizing stops along the corridor and between transit stops, and increasing overall green time for the roadway along which the streetcar operates.

Transit preferential treatments, including transit signal priority, may be easier to implement for Alternative 1, as the streetcar would operate in a one-way loop for the northern half of the alignment. With two-way operations, there could be situations when both northbound and southbound trains arrive at an intersection simultaneously; at these times, the signalization plans can only prioritize one movement at a time.

At intersections where the streetcar makes a turn, there is a greater potential for an impact on traffic intersection operations due to the need for separation of time (signal timing) and space (turning geometry) between the streetcar and other vehicles. Because of their larger turning radius, the streetcar vehicle may require additional space for to complete a turning maneuver, which can impact adjacent travel lanes and create the potential for conflicts. Therefore, , dedicated signal phases are provided to allow a transit vehicle to initiate and complete a turning maneuver without any conflicts. This exclusive time would require a transit vehicle to be in position at the front of a vehicle queue and to have all conflicting movements (vehicle and non-motorized) stopped. As a result of the exclusive time, traffic operations could be impacted. The relative scale of the impacts can vary depending on existing intersection operations, available capacity, upstream and downstream configurations, and the signal timing and phasing. Based on these factors, there is the potential for impacts to traffic operations at the following intersections, and further analysis will be required in future phases of design:

- Central Avenue and Lomita Avenue (both Alternatives)
- Central Avenue and Stocker Street (Alternative 1 only)
- Brand Avenue and Stocker Street (Alternative 1 only)
- Brand Avenue and Lomita Avenue (both Alternatives)

In addition to potential traffic impacts due to turning movements, additional operational issues could occur at intersections adjacent to planned stations. An important consideration is whether each station will be nearside (before the intersection) or farside (after the intersection).

In general, nearside stops provide opportunities for transit vehicles to board/alight passengers during the red phases of the signal operations. Another advantage of nearside stops is the opportunity to facilitate a transit movement that requires exclusivity, such as a queue jump. With a queue jump, a transit vehicle can be the first in a vehicle queue and utilize an exclusive transit phase without conflict.

While nearside stops can provide benefits to transit vehicles in certain conditions, there are potential impacts to intersection operations particularly at intersections with higher right-turning movements. At these locations, this conflict may cause increased vehicle queues and delays. In addition, although transit vehicles can take advantage of stopped conditions for boarding, there is the potential for incurring additional delay to both the streetcar and traffic flow, such as due to train deceleration, if the train arrives during the green phase, or if the boarding process extends past the red phase.

Compared to nearside stops, farside stops provide benefits for more reliable transit service by removing any additional intersection control delay compared to nearside stops if transit signal priority treatments are implemented (because the signal can hold the green phase to allow the streetcar to travel through the intersection without stopping). However, farside stops can result in impacts to intersection and roadway operations if vehicular queues extend into the intersection behind a stopped transit vehicle.

4.1.8. Parking Impacts

The focus of the parking analysis is to document on-street parking inventory within the study area along the proposed alignments and to identify potential impacts due to the guideway and station locations. Parking types within the study area include a range of parking management strategies such as unpaid time limited, paid time limited, loading zones, and valet spaces.

There are a total of 350 total parking spaces along Central Avenue between Railroad Street and Stocker Street (166 on the west side of the street and 184 on the east side). All parking spaces along Central Avenue are parallel to the curb with a mixture of unpaid timed and paid/metered time spaces.

There are a total of 417 parking spaces along Brand Boulevard between Lomita Avenue and Stocker Street (194 on the west side of the street and 223 on the east side with a mixture of angled and parallel parking spaces.

The guideway would not result in the loss of parking where the adjacent parking is parallel to the curb. Since all parking on Central Avenue is parallel, the guideway would not result in the loss of parking on Central Avenue under either alternative.

At locations where there is angled parking, the parking would need to be reconfigured as parallel parking to eliminate conflicts with the streetcar, resulting in a loss of parking in these areas. **Table 4-2** shows the potential loss of parking spaces on Brand Boulevard resulting from each alternative, based on the conceptual designs conducted for this feasibility study. During future design efforts, it may be possible to optimize the design to reduce the loss of parking. Because Alternative 1 travels in only the SB direction on Brand Boulevard, it has approximately half the parking impact as Alternative 2: the total number of parking spaces that would be

eliminated under Alternative 1 is 60 spaces, all along the west side of Brand Boulevard. Alternative 2 would eliminate another 63 spaces on the east side of the street, for a total of 123 spaces.

In addition to the loss of parking resulting from the guideway, the stations required for each alternative would result in an additional loss of parking. Based on an analysis of the number of existing parking spaces at proposed station locations, it is estimated that the stations would result in the loss of an additional 30 to 34 parking spaces under either alternative.

Table 4-2. Parking Impacts due to Guideway on Brand Boulevard

Parking Spaces Eliminated					
Segment	Existing Parking Spaces		Alternative 1	Alternative 2	
	West Side	East Side	West Side	West Side	East Side
Stocker Street - Dryden Street	39	36	0	0	0
Dryden Street - Fairview Avenue	14	19	0	0	0
Fairview Avenue - Glenoaks Boulevard	11	9	0	0	0
Glenoaks Boulevard - Arden Avenue	0	0	0	0	0
Arden Avenue - Monterey Road	3	0	- 3	- 3	0
Monterey Road - Goode Avenue	0	0	0	0	0
Goode Avenue - Sanchez Drive	0	0	0	0	0
Sanchez Drive - Doran Street	4	0	- 4	- 4	0
Doran Street - Milford Street	7	0	- 7	- 7	0
Milford Street - Lexington Drive	19	11	- 8*	- 8*	0
Lexington Drive - California Avenue	33	33	- 15*	- 15*	- 14*
California Avenue - Wilson Avenue	31	26	- 8*	- 8*	- 12*
Wilson Avenue - Broadway	0	29	0	0	- 11*
Broadway - Harvard Street	4	15	0	0	- 10*
Harvard Street - Caruso Avenue	0	8	0	0	0
Caruso Avenue - Colorado Street	7	9	0	0	- 4*
Colorado Street - Elk Avenue	8	12	- 3*	- 3*	- 4*
Elk Avenue - Lomita Avenue	14	16	- 12*	- 12*	- 8*
Total	194	223	-60	-60	-63

Source: Kittelson & Associates, 2020

* - assumes conversion from angled parking to parallel parking

4.1.9. Construction Considerations

Constructing a streetcar project will create temporary disruptions to traffic, utilities, and affect businesses and people who work and live along the route. These temporary construction impacts can be minimized through traffic control, construction phasing, and placing phasing requirements on the contractor during the construction period. A traffic management plan will be developed to address these items in future phases of project engineering and design.

The contractor will need secure space to store materials and vehicles and have a trailer for daily construction operations. These are typically vacant lots, unused parking areas, or other spaces that would cause minimal disruption during construction. They will be identified in future phases of project engineering.

Specific construction considerations along the corridor are described below.

Glendale Transportation Center (Both Alternatives)

The construction of streetcar tracks, platform and station amenities, electrical systems, utility relocations, and associated roadway improvements must accommodate the GTC's daily operations, including train and bus operations, traffic movement, pedestrians, bicyclists, GTC employees, and nearby properties. A construction phasing plan will be developed for this area during future phases of project engineering.

Central Avenue (Both Alternatives)

The construction of streetcar tracks, platform and station amenities, electrical systems, utility relocations, and associated roadway improvements must accommodate access to adjacent properties, pedestrians and bicyclists, and traffic movement.

Alternative 1 – Central/Brand Loop

The construction of streetcar tracks, platform and station amenities, electrical systems, utility relocations, and associated roadway improvements must accommodate access to adjacent properties, pedestrians and bicyclists, and traffic movement. Under this alternative, these impacts will be confined to the northbound lanes of Central Avenue and the southbound lanes of Brand Boulevard within downtown Glendale.

An advantage of this alternative is that it provides greater flexibility for utility relocation within downtown, because tracks will be laid on only one side of the street. This flexibility could simplify construction staging and traffic management. A disadvantage, however, is that construction activity will be spread across a larger portion of downtown.

A construction challenge will be the existing overpass at the Galleria, south of Broadway. Engineering design must not modify or alter the existing overpass with streetcar tracks, electrical systems, or other features.

The traffic management plan will have to accommodate seasonal traffic patterns, including access to and from Galleria and Americana during the holiday period.

Alternative 2 – Central/Brand Two-Way

Construction of streetcar tracks, platform and station amenities, electrical systems, utility relocations and associated roadway improvements must accommodate access to adjacent properties, pedestrians and bicyclists, and traffic movement. These impacts will be confined to Brand Boulevard withing downtown under this alternative.

The traffic management plan will have to accommodate seasonal traffic patterns, including access to and from Galleria and Americana during the December/January holiday period.

4.2. COMPARISON OF PRELIMINARY ALTERNATIVES

Based on conceptual engineering and operational analysis, both Alternative 1 and Alternative 2 are feasible and functional; however, the two alternatives each have advantages and disadvantages.

Table 4-3 summarizes the key characteristics of the route alternatives. The two alternatives have similar lengths, number of stations, end-to-end travel times, and capital costs. Alternative 2 has slightly higher forecast ridership, as well as lower operating costs, because it serves a single, more established commercial corridor in downtown Glendale. However, Alternative 2 would also focus potential construction and parking impacts on that corridor, Brand Boulevard.

Table 4-3. Route Alternatives Summary

Category	Alternative 1 Central/Brand Loop	Alternative 2 Central/Brand Two-Way
Route length	2.9 miles end-to-end (5.8 miles of track)	2.9 miles end-to-end (5.8 miles of track)
Number of stations/station pairs	9	9
Ridership (weekday)	1,400 to 1,800 (growth model) 4,000 (case study model)	1,500 to 2,000 (growth model) 4,000 (case study model)
End-to-end travel time (AM/PM/Off-peak), minutes	44/50/38	44/51/35
Major shopping destinations, hotels, and cultural attractions along alignment	9	10
Residential units along alignment	579	281
Commercial uses along alignment (square feet)	6.2 million	8.15 million
Existing daily transit riders along route	3,537	3,921
Traffic impacts from operations	Potentially greater impacts due to additional turning movements	Potentially fewer impacts due to fewer turning movements

Category	Alternative 1 Central/Brand Loop	Alternative 2 Central/Brand Two-Way
Parking impacts (on-street spaces removed)	90 to 94	153 to 157
Construction impacts	<ul style="list-style-type: none"> • Greater flexibility within each street • More streets impacted 	<ul style="list-style-type: none"> • Greater impact on each street • Fewer streets impacted

Alternative 1 would serve a larger geographic area, supporting recent and ongoing mixed-use development on Central Avenue, but the one-way loop is less intuitive for riders and causes indirect travel for some trips. The alignment on Central Avenue north of Broadway also would potentially conflict with Metro’s planned BRT and the existing bike lanes in that area.

Alternative 2 would reinforce Brand Boulevard as a multi-modal corridor in accord with local plans with the most direct and easy to understand route that serves the heart of downtown Glendale. It would concentrate potential economic development benefits on Brand Boulevard, but since Brand Boulevard is already a highly built environment, it may promote fewer redevelopment opportunities.

Because Alternative 2 has higher forecast ridership, has the most intuitive route for riders, best serves the established commercial corridor along Brand Boulevard, and would not conflict with Metro’s planned BRT alignment, it is recommended that Alternative 2 be considered for further planning, engineering, and environmental evaluation. Future planning and engineering efforts should seek to minimize parking impacts through techniques such as the promotion of shared parking among land uses in the downtown area.

5. RECOMMENDED ALTERNATIVE INTEGRATION

Based on its higher forecast ridership and other factors, Alternative 2 is recommended for further planning, engineering, and environmental evaluation. This chapter identifies opportunities to integrate the recommended alternative into the transit and active transportation network in the surrounding area to achieve the greatest potential benefits of the streetcar.

5.1. TRANSIT INTERFACE

The purpose of reviewing transit interface with the proposed Glendale Streetcar is to maximize the connectivity benefits of the streetcar by integrating it into the local and regional transit network in such a way that it complements existing services and creates a network where all routes reinforce one another and increase overall transit use in Glendale.

This section reviews existing and planned bus transit routes in the study area, identifies bus interface points with the recommended alternative, and proposes potential modifications to the bus network to provide a seamless and complementary transit system in south Glendale.

5.1.1. Planned Transit System Interface Locations

To optimize the connections between multiple transit lines for the ideal transit user experience, the potential location of these connections must be identified. Only then can improvements needed to build a stronger transit network incorporating the Glendale Streetcar be determined. Bus service and streetcar service should bolster, not hinder one another. For example, because bus lines have more stops than the recommended streetcar alternative, bus service with frequent stops on the same route as the streetcar could slow down the streetcar service. Such a situation should be avoided and, instead, routes and stops should complement one another to create transit system that is intuitive and easy to use.

The recommended alternative route is partially along existing Beeline Routes 1 and 11, and it would overlap with parts of Metro Routes 92, 94, 180, and Metro Express Route 501. The other bus routes identified in **Table 5-1** would intersect with this alternative, also allowing a transit connection. The Metro NextGen Bus Plan will increase bus frequency along some routes and will briefly re-route Metro Shuttle Route 603 to the Glendale Metrolink Station prior to continuing the route along San Fernando Road. The Metro NextGen Bus Plan does not include any additional route changes within the study area. The recommended alternative would also provide a connection to the planned North Hollywood to Pasadena BRT at Broadway and Brand Boulevard. The stop-to-station interface points of each bus route are described in **Table 5-1**.

Table 5-1. Metro and Glendale Beeline Interface with Proposed Streetcar Stations

Station	Direct Interface (On same street)	Indirect Interface (On cross street)	Indirect Interface (At nearby intersection)
Glendale Transportation Center	None	None	<ul style="list-style-type: none"> Beeline Routes 1/11/12

Station	Direct Interface (On same street)	Indirect Interface (On cross street)	Indirect Interface (At nearby intersection)
Central Avenue/Los Feliz Road	• Beeline Route 1*	• Metro Route 603	• Metro Routes 92/94/180
Central Avenue/Chevy Chase Drive	• Beeline Route 1	None	None
Central Avenue/Maple Street (southbound)	None	None	• Metro Routes 92/94/180 • Beeline Route 1
Central Avenue/Lomita Avenue (northbound)	• Beeline Route 1	None	• Metro Routes 92/94/180 • Beeline Route 5
Brand Boulevard/Lomita Avenue (southbound)	• Metro Route 180 • Beeline Route 1*	• Metro Routes 92/94	None
Brand Boulevard/Americana Wy	• Metro Routes 92/94* • Beeline Routes 3/4*	None	None
Brand Boulevard/Broadway (southbound)	• Metro Routes 92/94/180/501 • Beeline Route 1/4*	• Metro Route 180 • Beeline Routes 3/11	• Metro Line 180 • Beeline Routes 1/3/11
Brand Boulevard/California Avenue	• Metro Route 92* • Beeline Route 1*	None	• Metro Route 92 • Beeline Routes 1/11
Brand Boulevard/Doran Street	• Metro Route 501* • Beeline Routes 1/11*	None	• Metro Routes 92/501 • Beeline Route 11
Brand Boulevard/Monterey Road	• Metro Route 92* • Beeline Routes 1*	• Beeline Route 11	• Metro Route 92 • Beeline Route 1
Brand Boulevard/Stocker Street (southbound)	None	• Beeline Routes 1 • Beeline Route 7	None

Source: Metro, 2021

*Stop overlaps with proposed platform or platform option

Analysis of Transit Connectivity

Stations on the southern half of the recommended alternative’s alignment are better connected to the existing bus network than are stations on the northern half, with multiple Metro and Beeline connections on San Fernando Road, Chevy Chase Drive, Colorado Boulevard, and Broadway. Metro Route Line 92, 94 and 180, Metro Express Line 501, and Beeline Routes 3, 5, 11, and 12 enter the study area from the north, but only Metro Line 92, 94, and 180, Metro Express Line 501 and Beeline Route 7 and 11 connect to either alternative in the northern part of the study area.

The recommended alternative duplicates service of parts of Beeline Route 1 on Central Avenue. Route 1 operates at a 10-minute headway from 6 a.m. to 7:45 p.m., while the proposed operating hours of the streetcar are 6 a.m. to 12 a.m. on weekdays with a headway of 10 minutes during the peak. Because the bus line has more stops than the proposed alternatives, their service with more frequent stops could slow down the streetcar service.

The Beeline Route 11, which provides express service for the South Glendale communities to the Glendale Transportation Center during peak hours, would also significantly overlap with the streetcar alternative, also traveling north and south on Brand Boulevard. Unlike Route 1, Route 11 has fewer stops than the proposed streetcar; as a result, the streetcar could slow down Route 11's express service to and from the Glendale Transportation Center.

5.1.2. Conceptual Transit Service Modifications

As demonstrated by their operating patterns, Metro transit service in Glendale primarily serves those traveling in and out of Glendale to the neighboring cities within the Los Angeles region. In contrast, the Glendale Beeline primarily to serve local travel within Glendale and to adjacent communities, a similar function as the proposed streetcar. Therefore, opportunities for transit service modifications are focused on the Glendale Beeline bus service in order to create a comprehensive transit system within the city, where bus transit and streetcar service complement one another and improve the transit system as a whole.

The Glendale Beeline network will provide a critical link from nearby communities to the Glendale Streetcar. To best serve transit riders, modifications to Beeline routes should be considered to provide complimentary service and enhance connectivity.

All Beeline routes will interface with the proposed streetcar at some point in the system. Some routes have significant overlap with part or all the proposed streetcar alternative, which will result in redundant service if maintained at the same hours and headways. The following proposed modifications would optimize Beeline service to support the streetcar:

- **Routes 1** –Route 1 provides service from North Glendale to the Glendale Metrolink Station in the northbound and southbound directions along Central Avenue. Since the proposed streetcar provides service from the Glendale Metrolink Station to the intersection of Colorado Street and Central Avenue, the proposed streetcar is more likely to slow Route 1's service than the bus is to slow the streetcar. Therefore, Route 1 should be modified to terminate at the Colorado Street and Central Avenue intersection where it will connect to the proposed streetcar.
- **Route 5** – To facilitate convenient connection to the streetcar in the Fremont Park neighborhood, reroute Route 5 to continue east on Stocker Street to Brand Boulevard (with a stop on Stocker Street and Brand Boulevard), south on Brand Boulevard to Glen Oaks Boulevard, and west on Glen Oaks Boulevard where it will return to its current route on Pacific Avenue. Route 5 will connect to the streetcar in the Pacific-Edison neighborhood between Colorado Street and Chevy Chase Drive.
- **Route 11** – Unlike the local service provided by Route 1 and the proposed streetcar, Route 11 provides an express commuter service to link Glendale residents and workers to the Glendale Metrolink Station. As Route 11 has fewer stops within the same geographic area

than the proposed streetcar, the streetcar is more likely to slow Route 11's express service than the bus is to slow the streetcar. Therefore, Route 11 should be modified to run on Central Avenue from Glen Oaks Boulevard to Colorado Street, and on Brand Boulevard from Colorado Street to Los Feliz Road.

5.2. FIRST/LAST MILE CONNECTIONS

As planning and design continues for the proposed streetcar, opportunities to facilitate connections with adjacent districts and neighborhoods should be incorporated into project design. Good "first/last mile" connections support the ridership of the streetcar line and help activate and enhance these adjacent areas.

The *Citywide Pedestrian Plan* (City of Glendale, 2021) selected the transit stop at Brand Boulevard and SR-134, which is along the proposed streetcar route, as one of its first/last mile study areas. **Figure 5-1** shows the recommended improvements, including traffic calming, crosswalk enhancements, wayfinding, and improved bicycle and pedestrian connections over SR-134. These recommended improvements can serve as a model for first/last mile improvements along the rest of the streetcar alignment, which should focus on enhancing mobility to and from the transit stops along the alignment, including wayfinding improvements.

Figure 5-1. Proposed Brand Boulevard/SR-134 First/Last Mile Improvements



Source: City of Glendale, 2021

First/last mile improvements along the streetcar alignment should incorporate the following considerations related to bicycle access:

- Bicycles should not be restricted from the streetcar route or prohibited from passing through station locations. In a multimodal integrated transportation system, the provision of on-street bicycle facilities helps provide critical first/last mile connections between the transit stops and local employment and commercial centers. Separated and/or dedicated bicycle facilities should be incorporated to minimize operational conflicts.

- Locations to provide safe and secure bicycle parking at station locations should be identified to further enhance multimodal travel options.
- Multiple bicycle facility types serving the same corridor could be implemented to provide for a range of cycling abilities and styles (such as an on-street bike lane and a parallel low-traffic route). A redundant bicycle network can assist with the provision of a complete multimodal system.
- Wayfinding signs and markings should be created for bicyclists, particularly to indicate turning opportunities and routes to the streetcar stops and key destinations.
- Advanced stop bars are recommended at all intersections to increase the awareness and separation of modes around conflict zones. Pavement markings and signing at tracks indicating that bicyclists should yield to streetcars also assist in user awareness.
- Bicycle facilities should facilitate right-angle turns by bicyclists as they cross the streetcar tracks. Specifically, there is a high risk for bicycle wheels to get stuck or caught in in-street rail when crossing at an angle or parallel to the tracks. Transit agencies have explored using flange filler material that is typically used for heavy rail, which can reduce danger for riders. However, research on these installations indicate that flange filler is not appropriate for streetcar and light rail tracks.

6. COST ESTIMATES

6.1. CAPITAL COSTS

This section presents capital cost estimates prepared for the recommended Central/Brand Two-Way alternative. Since the project is at the early conceptual engineering design stage, the capital cost estimate is a 1 to 2% level design estimate within the requirements of the American Association of Cost Engineers (AACE) International Class 5 estimate as defined in AACE Recommended Practice No. 17R-97. The estimate uses probable construction cost based on unit prices from similar projects.

The methodology used to generate the capital cost estimates is consistent with Federal Transit Administration (FTA) guidelines. The basis of FTA guidance on cost estimating is its Standard Cost Categories (SCC), which enables all FTA-funded projects to develop budget baselines in a uniform manner and enables projects to develop budget baselines that summarize to the SCC. A unit cost library was developed to current year dollars (First Quarter 2020) and the quantities were estimated and used to prepare this cost estimate. No escalation beyond 2020 was included.

Parametric estimating techniques were used where the level of design does not support quantity measurements. These parametric estimates are based upon the previously bid OC (Orange County) Streetcar, Downtown LA (Los Angeles) Streetcar, Crenshaw/LAX Light Rail Transit (LRT), East Side Phase 2 LRT, Exposition Line LRT projects and other similar projects, with unit prices escalated to the present day. Some streetcar system parametric cost elements were also derived from the current FTA database.

The cost estimate includes guideway and track, stations, ancillary facilities such as the OMF, system, right-of-way, vehicles, and design and other professional services. The estimate also includes potential utility relocation, impacts to surface structures, temporary construction impacts, environmental consideration, various maintenance facilities locations, and right-of-way requirements.

Additionally, the cost estimate includes appropriate design allowances, allocated contingency and unallocated contingency. In the SCC, allocated contingencies are included to address lack of scope and quantity definition during the design stages. The size of the allocated contingency depends on the complexity of each SCC category and the stage of engineering completion. Unallocated contingency is intended to address “unknown unknowns,” or to simply reflect a prudent amount to cover unanticipated events, such as political events, labor strife, weather, unexpected site conditions, mercurial commodity pricing, unfavorable market conditions, bid risk, and change orders.

Table 6-1. presents a summary of the capital cost estimates of the recommended alternative in 2020 dollars by SCC. The range of probable capital cost estimate could be 5% higher or 15% lower than these estimates. The SCC worksheet is included in Appendix B.

Table 6-1. Summary of Capital Cost Estimates (2020 Dollars, x000)

Cost Category	Estimate
Guideway and track elements	\$61,359
Stations, stops, terminals, intermodal	\$11,628
Support facilities—yards, shops, administration buildings	\$58,841
Sitework and special conditions	\$63,088
Systems	\$73,998
Construction Sub Total	\$268,912
Right-of-way, land, existing improvements	\$24,544
Vehicles	\$35,200
Professional services	\$84,169
Unallocated contingency	\$82,565
Finance charges	Not included
Total cost (2020 dollars)	\$495,391

As previously discussed, each cost category includes an allocated contingency, in addition to the unallocated contingency shown in **Table 6-1**. Together, the allocated and unallocated contingencies represent 41.5% of the total cost estimate, as shown in **Table 6-2**.

Table 6-2. Total Allocated and Unallocated Contingency (2020 Dollars, x000)

Cost Categories	Estimate
Allocated Contingency	\$62,646
Unallocated Contingency	\$82,565
Total Contingency	\$145,211
Contingency as Percent of Capital Cost	41.5%

6.2. OPERATING COSTS

Operating costs were derived from National Transit Database annual operating costs for similar streetcar systems on a per-route mile basis. To estimate potential streetcar annual operating costs, vehicle requirements and annual vehicle hours were determined based on the operating schedule outlined in **Table 3-4**. Operating costs on streetcar systems vary depending on local circumstances, as shown in **Table 6-3**. This analysis utilizes a planning level revenue cost of \$250/hour. Although there is potential for the Glendale Streetcar to operate at a lower cost per hour, \$250/hour is appropriate for this early stage of project development. Vehicle requirements and operating characteristics were developed from the travel times, headways, and operating hours outlined above.

Table 6-3. Case Study Operating Costs

System	Cost per Revenue Hour
Streetcar System	
Tucson Sun Link	\$176
Q-Line (Detroit)	\$210
Seattle Streetcar	\$217
Kansas City Streetcar	\$218
The Hop	\$220
Portland Streetcar	\$236
Cincinnati Bell Connector	\$244
Average	\$217
Local System	
Beeline	\$83
Metro - Bus	\$171
Metro - BRT	\$262
Metro - LRT	\$464

Sources: National Transit Database, 2017 Transit Agency Profiles

Table 6-4 summarizes the conceptual operating costs for the recommended alternative. The alternative would require up to six streetcar vehicles running at the same time to maintain desired headways during weekday peak periods.

Based on its operating characteristics, the recommended alternative would have 26,558 annual revenue operating hours. Using a \$250/hour cost results in a total estimated annual operating cost of \$6.6 million.

Table 6-4. Conceptual Operating Plan and Costs

Days	Period	Start	End	Vehicles Required	Hours	Vehicle Hours	Days in Year	Annual Revenue Hours
Weekdays (Monday – Friday)	Early AM	6:00 a.m.	7:00 a.m.	2	1	2	260	520
	Peak	7:00 a.m.	7:00 p.m.	6	12	72	260	18,720
	Night	7:00 p.m.	12:00 a.m.	2	5	10	260	2,600
	Total hours							
Saturday	Early AM	7:00 a.m.	10:00 a.m.	2	3	6	52	312
	Peak	10:00 a.m.	7:00 p.m.	4	9	36	52	1,872
	Night	7:00 p.m.	12:00 a.m.	2	5	10	52	520
	Total Hours							

Days	Period	Start	End	Vehicles Required	Hours	Vehicle Hours	Days in Year	Annual Revenue Hours
Sunday	Early AM	8:00 a.m.	12:00 p.m.	2	4	8	53	424
	Peak	12:00 p.m.	6:00 p.m.	4	6	24	53	1,272
	Night	6:00 p.m.	9:00 p.m.	2	3	6	53	318
	Total Hours							
Total Annual Revenue Hours								26,558
Cost Per Hour								\$250
Annual Operating Cost								\$6.6 million

7. IMPLEMENTATION STRATEGY

This chapter discusses the required steps to fund and implement the Glendale Streetcar project. It begins with a review of successful funding strategies employed by comparable projects and an inventory of available funding sources. It then reviews the potential ratings of the project on the major criteria used by the federal government's primary transit funding source, the Capital Investment Grant (CIG) program. It concludes with an overview of the approvals and actions that will be required to implement the project, along with a typical timeframe for completion of each step in the process.

7.1. FUNDING STRATEGIES

7.1.1. Case Studies

This section describes three successful streetcar funding case studies from across the country to highlight how different cities were able to implement similar streetcar systems.

KC Streetcar – Kansas City, MO

The KC Streetcar opened in 2016, connecting districts within Kansas City's central city, traveling 2.2 miles along the city's north-south Main Street corridor. Operations for the KC Streetcar are managed by the not-for-profit Kansas City Streetcar Authority (KCSA). Funded by the local tax base, the KCSA was incorporated in 2012 following the creation of the Kansas City Transportation Development District (TDD). The total capital cost of the initial Main Street route was approximately \$102 million.

Capital Costs

The KC Streetcar leveraged multiple federal funding opportunities to fund the construction of the initial route. Most sizable, was a \$20 million Transportation Investment Generating Economic Recovery (TIGER) grant. An additional \$16 million was procured through the Surface Transportation System Funding Alternatives Program. Both programs are administered by the United States Department of Transportation (U.S. DOT) and were established by the Fixing America's Surface Transportation (FAST) Act, signed into law in December 2015. The KC Streetcar also received \$1.1 million in the form of a Congestion Mitigation and Air Quality (CMAQ) Improvement Program grant, a federal funding program aimed at improving air quality and congestion (TRB, 2016).

The City of Kansas City acted as the local sponsor for the project providing funding match for federal grants. A Special Obligation Bond made up over half of the project's total capital funding, a sum of \$62.9 million. To repay this bond, Kansas City formed a TDD, with approval from downtown residents through official vote, that functions as a special taxing district. Within the TDD there is a special sales tax, not to exceed 1%, and a special assessment on real estate within its boundaries. As of April 2016, Kansas City's TDD had experienced over \$1.7 billion in completed, in progress, or publicly announced development projects. See **Table 7-1** for a funding summary.

Table 7-1. KC Streetcar Funding Sources

Federal Sources	Funding Level	Local Sources	Funding Level
TIGER grant	\$20M	TDD	\$62.9M
Surface Transportation Program	\$16M	Other City Commitment	\$2.0M
CMAQ	\$1.1M		
Total Federal Sources	\$37.1M	Total Local Sources	\$64.9M

Source: Transportation Research Board (TRB). Guide to Value Capture Financing for Public Transportation Projects. 2016.

M = million

Operating Costs

The KC Streetcar operations are funded from a variety of sources outside of fare box revenue and sponsorships, including:

- Federal grants
- Voter-approved sales tax increase
- Special property and parking assessments

QLINE – Detroit, MI

This 6.6-mile streetcar loop serves the Midtown, New Center, and North End districts of downtown Detroit, connecting many of the city’s cultural and civic institutions. Opened to the public in 2017, the system recorded more than 1.3 million riders in its first year of operation. Detroit’s streetcar system is owned and operated by M-1 Rail, a not-for-profit formed in 2007 to spearhead the design, construction, and operation of the system. The QLINE runs along the heavily populated Woodward Avenue corridor, which is home to 40 % of Detroit’s jobs. The total capital cost of the initial route was \$182.2 million.

Capital Costs

The QLINE received two TIGER grants to fund Detroit’s downtown streetcar system. The initial TIGER grant awarded to the project was for \$25 million. The second TIGER Grant—a \$12.2 million grant—was critical in leveraging funding from private and philanthropic sources.

The New Market Tax Credit program (NMTC) was created to help economically distressed areas attract private investment by providing investors with a Federal tax credit. This program generated \$9.4 million for the QLINE. Through NMTC, the U.S. Department of the Treasury gives tax credit authority to Community Development Entities through an application process. The NMTC program was useful in Detroit as the city had experienced economic hardship with low private investment in the city. NMTC credit allowed M-1 Rail access to funds with more reasonable terms (Detroit Free Press, 2017).

Detroit’s system is unique in that a majority of capital funding for the project came from private sector and philanthropic sources. Private donors include The Kresge Foundation (\$49.8M),

Quicken Loans (\$11.4M), Ford Motor Company (\$7M), and Penske Truck Leasing (\$7M). An additional nine private donors combined for \$27 million in large-sum private donations.

Local public sector investment for the QLINE came from the city’s Downtown Development Authority (\$9M), the Michigan Economic Development Corporation (\$7M), the State of Michigan (\$10M), and Wayne County, MI (\$3M). See **Table 7-2.** for a funding summary.

Table 7-2. QLINE Funding Sources

Federal Sources	Funding Level	Local Sources	Funding Level
TIGER grants (two awards)	\$37.2M	Private/philanthropic funding	\$113.6M
NMTC	\$9.4M	Michigan DOT	\$10.0M
		Wayne County	\$3.0M
		Detroit Downtown Development Auth.	\$9.0M
Total Federal Sources	\$46.6M	Total Local Sources	\$135.6M

Source: Detroit Free Press. “Ready for the QLINE? Detroit’s streetcar gets ready to debut.” May, 2017

Operating Costs

QLINE operations are funded from a variety of sources outside of fare box revenue and sponsorships, including:

- Private and philanthropic funding
- Regional Transit Authority funding - *planned* (after 10 years of service)

The Hop

The initial route for Milwaukee’s streetcar, The Hop, travels 2.1 miles through downtown connecting the city’s Intermodal Station with near downtown neighborhoods. The project received approval from the Milwaukee Common Council in 2015, and construction on the starter route, the M-Line, began in 2016. Twenty-seven years afterward, a federal grant was awarded to the city, and operation began on The Hop in late 2018. The initial route had a capital cost of \$98.8 million.

Capital Costs

In 1991, a federal grant worth \$289 million was allocated to construct a mass transit system connecting Milwaukee to nearby Waukesha, WI. Such a system never materialized in the Milwaukee region, with the federal dollars diverted to other programming, including The Hop. The amount diverted from this federal grant to the Milwaukee streetcar project totaled \$54.9 million.

The local funding for the project came from three Tax Incremental Districts (TID) near the streetcar route. TIDs are a form of tax increment financing (TIF) that utilizes new investment in areas surrounding the streetcar extension by capturing the increment property tax value from new development and using that for streetcar capital costs.

Two TIDs were amended to allow for incremental value to flow into the streetcar project, and an additional District was created for the purpose of funding the system. Combining for \$59 million, TIF funding accounted for 47.6% of the project’s construction costs. Of ten streetcar projects studied by the Wisconsin Policy Forum (WPF), only two others utilized TIF to cover construction costs (Cincinnati 12.4%, Portland 8.2%). According to the WPF report (September 2019), Milwaukee’s dependence on TIF is largely a result of limited funding mechanisms allowed under Wisconsin state law. Local funding sources relied upon for other similar streetcar projects that were not available to Milwaukee’s system include local sales taxes and state transit capital programs¹. See **Table 7-3**. for a funding summary.

Table 7-3. The Hop Funding Sources

Federal Sources	Funding Level	Local Sources	Funding Level
Interstate Cost Estimate	\$54.9M	TIF	\$43.9M

Source: www.thehopmke.com

Operating Costs

Operations of The Hop are funded from a variety of sources outside of fare box revenue and sponsorships, including:

- FTA Urbanized Area Formula and State of Good Repair Grants
- CMAQ Program funding
- Parking revenue

7.1.2. Key Funding Sources Inventory

This section inventories key potential funding sources available to the Glendale Streetcar Project and the various considerations and next steps of the sources.

Table 7-4. provides a summary of key potential sources identified through project experience along with local and national expertise. Future project phases will investigate these potential sources more to help identify likely sources to be pursued for the project.

Table 7-4. Potential Funding Sources

Level	Department/Agency	Funding Source	Eligible Costs	Considerations
Federal	U.S. DOT, FTA	CIG Program (Section 5309)	Capital	See Detailed Evaluation in Section 7.2
	U.S. DOT	RAISE (formerly BUILD, TIGER)	Capital	Highly competitive discretionary grant program.
	U.S. DOT, FTA	CMAQ Program	Capital and operating	Focused on high level of effectiveness in reducing air pollution.

¹ The Hop Streetcar: About. <https://thehopmke.com/about/#faq>

Level	Department/Agency	Funding Source	Eligible Costs	Considerations
	U.S. DOT, FTA	Urbanized Area Formula Grant Program (Section 5307)	Capital	Formula allocation from LA Metro.
	U.S. DOT	TIFIA	Capital	Provides project sponsors credit assistance for surface transportation projects.
State	State Controller's Office	Greenhouse Gas Reduction Fund (Various programs/allocations)	Capital and operating	Competitive applications process for state Cap-and-Trade dollars.
	State Controller's Office	State Transit Assistance	Capital and operating	Funding distributed to regional planning agencies based on a population and operations formula.
	Strategic Growth Council	Affordable Housing and Sustainable Communities	Capital	Supports projects designed to reduce greenhouse gas emissions, including transit capital projects.
Local	Local	Enhanced Infrastructure Financing District	Capital and operating	Requires voter approval and sufficient values.
	Metro	Sales Tax (Prop A, Prop C, Measure R, Measure M, TDA)	Capital and operating	Potential funding dependent taxes generated.
		Fare Collection	Operating	Collection of fare requires fare system (tickets, enforcement).
Private		System Sponsorship	Typically, operating costs	System, stops and vehicle sponsorships provide private funding opportunity.

Note:

- BUILD = Better Utilizing Investments to Leverage Development
- RAISE = Rebuilding American Infrastructure with sustainability and Equity
- STA = State Transit Assistance
- TDA = Transportation Development Act
- TIFIA = Transportation Infrastructure and Finance Innovation Act

Federal Funding

Capital Investment Grant Program

This FTA discretionary program provides capital cost funding for fixed guideway projects as well as corridor-based bus rapid transit that emulate rail projects. Eligible systems include rapid, commuter, and light rail systems and streetcar projects. State and local governments, including transit agencies, are eligible recipients of funding via this program. Construction grants are awarded to qualified projects that adhere to statutory requirements as outlined in the FAST Act. These include a multi-step, multi-year process and attainment of at least a “Medium” overall rating.

The program has four qualifying categories: New Starts, Small Starts, Core Capacity, and Programs of Interrelated Projects. Depending on the final capital costs and desired federal match, the Glendale Streetcar project is most closely aligned with the intentions of the Small Starts and New Starts programs.

The competitive Small Starts and New Starts funding programs are dedicated to new or expanding fixed guideway transit systems across the United States. The FTA limits discretionary Small Starts funds for projects with a total estimated capital cost of less than \$300 million and a maximum program funding request of less than \$100 million. The FTA limits discretionary New Starts funds for projects with a total estimated capital cost of greater than \$300 million or a program funding request of greater than \$100 million. (The Senate version of the bipartisan infrastructure bill currently pending before Congress would increase these numbers to \$400 million and \$150 million, respectively.) A local match of at least 20% is required for these programs (FTA, 2020).

Rebuilding American Infrastructure with sustainability and Equity

The RAISE program, formerly the BUILD and TIGER Discretionary Grant programs, receives hundreds of applications per competition to build and repair crucial elements of the nation’s freight and passenger networks. Annual funding for this already competitive program depends on Congressional appropriations and is heavily dependent upon current and future legislative processes. Capital projects may be awarded between \$5 million and \$25 million and require a 20% local match as specified in the Fiscal Year 2021 Appropriations Act.²

BUILD grant awarded streetcar projects in recent years include:

- Kansas City Streetcar Riverfront Extension (2020): \$14.2 million BUILD grant, \$20.2 million total project cost.
- Better Market Street Phase I (2018): \$15 million BUILD grant, \$80.7 million total project cost.
- Milwaukee Streetcar – extension (2016): \$14.2 million TIGER grant, \$28.4 million project cost.

² U.S. DOT. *RAISE Discretionary Grants*. <https://www.transportation.gov/RAISEgrants>

Projects are evaluated based on criteria including safety, environmental stewardship, quality of life, economic competitiveness, state of good repair, innovation, and partnership. The RAISE program diverges from prior iterations (BUILD, TIGER) as U.S. DOT will have an increased prioritization of projects that demonstrate improvements to racial equity, reduction of climate-related impacts, and creation of quality jobs.

CMAQ

Glendale is within the Los Angeles—South Coast Air Basin. This geography, as defined by the U.S. Environmental Protection Agency, is classified as non-attainment regarding particulate matter that have a diameter of less than 2.5 micrometers of particles in the air. This qualifies the Glendale Streetcar project for funding under the CMAQ program. Funds from this program may be used for transportation capital or operating projects or programs that are likely to contribute to the attainment or maintenance of a national ambient air quality standard. For operations funding, CMAQ funds can only be utilized within the first 3 years of service. In 2020, LA County was allocated \$157.7 million in CMAQ funding (Metro, 2020).

Urbanized Area Formula Program

As Glendale is within the Los Angeles Metropolitan Area it qualifies for funding from the formula-based Urbanized Area Program (5307) offered by the FTA. In LA County, LA Metro allocates 15% of funding on a discretionary basis and 85% by formula to itself and the non-Metro operators. Any funds utilized must provide a local match of 20% and funding can only be utilized for capital funding. In 2020, LA County received \$245.9 million in 5307 Program funding (Metro, 2020).

Eligible activities under this program include planning, engineering, design and evaluation of transit projects and other technical transportation-related studies; construction of maintenance and passenger facilities; and capital investments in new and existing fixed guideway systems including rolling stock, overhaul and rebuilding of vehicles, track, signals, communications, and computer hardware and software.

State Funding

Greenhouse Gas Reduction Fund

The Green House Gas Reduction Fund provides funding for transit that aligns with the Glendale Streetcar project under a variety of different allocations and programs, summarized below:

- The Low Carbon Transit Operations Program (LCTOP) provides operating and capital assistance for transit agencies to reduce greenhouse gas emission and improve mobility. Priority for this program is serving disadvantaged communities. The LCTOP is administered by California Department of Transportation (Caltrans) in cooperation with the state's Air Resource Board and Controller's Office. LCTOP funds are allocated to LA Metro and distributed to local operators.
- Administered by Caltrans in collaboration with the California State Transportation Agency (CalSTA), the Transit and Intercity Rail Capital Program funds capital improvements that modernize intercity, commuter, and urban rail and bus systems. The program aims to significantly reduce emissions of greenhouse gases, vehicle miles traveled (VMT), and

congestion. In four cycles of funding, \$5.8 billion have been awarded to 73 projects throughout the state (CalSTA, 2021).

State Transit Assistance

This statewide program distributes funding through a formula to Regional Transportation Planning Agencies 50% by population and 50% by transit operations. The program is funded through diesel fuel sales taxes and SB1 funds. The State Transit Assistance funding can be used to fund both capital and operating costs. LA County's allocation from this program was \$167.2 million in 2020 (Metro, 2020).

State and Regional Improvement Program

The State Transportation Improvement (STIP) is the 5-year program of capital improvements on and off the State Highway System that increase the capacity of the transportation system/ The projects in the STIP are proposed by regional agencies and Caltrans.

Projects proposed by regional agencies are included the Regional Transportation Improvement Program. As the Regional Transportation Planning Agency, LA Metro proposes regional projects for itself, Caltrans and local agencies.

Sales Tax Funding

LA County and California have a variety of sales tax levies that fund transit improvements. Existing Sales Tax Measures already in place are detailed below.

Caltrans Transportation Development Act

This legislation established two funding sources administered by Caltrans; the Local Transportation Fund (LTF), and the STA fund (previously discussed). The LTF returns funds from a ¼ cent general sales tax to counties. The funds are apportioned to each county by the State Board of Equalization according to the amount of tax collected in the county.

Article 4 of the TDA awards funding to public transportation systems for capital and operating assistance. The funding is available only to LA Metro and eligible municipal operators (as determined by farebox recovery ratio requirements) subject to the Formula Allocation Procedure based on vehicle service miles and fare revenue. In 2019, Article 4 allocated \$420.8 million to LA County for public transportation systems (Metro, 2020).

Los Angeles County Sales Taxes

LA County has four separate sales taxes that support transportation could partially be available to help fund portion of the Glendale Streetcar:

- **Proposition A:** A voter-enacted (1980) 0.5-cent sales tax in Los Angeles County. Twenty-five % of these funds are returned to local cities on a per capita basis through the Local Return Program and another 40% is for the Discretionary program, which is available to municipal operators. The primary current use of Prop A Discretionary funds is bond debt service for already-funded projects (Metro, 2021).
- **Proposition C:** A voter-enacted (1990) 0.5-cent sales tax for public transit purposes. Prop C returns 20% of funds to local municipalities through the Local Return Program. In addition

to the Local Return, LA Metro allocates additional Prop C funding through its Call for Projects process, a biennial competitive process that distributes funds to regionally significant transportation projects.

- **Measure R:** A voter-enacted (2008) 0.5-cent sales tax for public transit purposes. Measure R returns 15% of collections to local municipalities through Local Return. Other than Local Return, no other Measure R funding would be available to the Glendale Streetcar.
- **Measure M:** A voter-enacted (2016) 0.5-cent sales tax for transportation purposes (increasing to one cent in July 2039 at the expiration of Measure R). Measure M returns 16% of collections local municipalities. Other than Local Return, no other Measure M funding would be available to the Glendale Streetcar.

Local & Private Sources

Enhanced Infrastructure Financing District

This relatively new financing tool allows cities, counties, and special districts to form Enhanced Infrastructure Finance Districts (EIFDs) and issue TIF bonds. The implementation of EIFDs returns the ability to TIF for local communities that were no longer able to use tax increment to repay bonds financing infrastructure and other needed improvements in 2012.

As described in earlier case studies, TIF utilizes new investment in areas/districts by capturing the incremental growth in property or other tax value from new development. Under the EFID, new property tax growth can only be diverted if a taxing jurisdiction agrees to the diversion. Unlike TIF funding in some communities, the EFID requires no public vote to establish the authority, imposes no geographic limitations on where it can be used, and no blight findings are required. These EFIDs can be created by the legislative body of a city or a county with a specific district boundary. If the district will issue bonds, a 55% voter approval is required.

System Sponsorship

Sponsorship by local businesses is widely practiced by modern streetcar systems across the country. In exchange for naming rights and/or trainset advertisements, community partners provide funding for individual systems operational costs. Typical sponsorships come from entities with strong ties to the given city, much like naming rights for professional sports facilities. Such sponsorships include:

- The Hop – Milwaukee, WI: A 12-year, \$10-million sponsorship with Potawatomi Hotel & Casino
- Cincinnati Bell Collector – Cincinnati, OH: 10-year, \$3.4-million naming rights and station branding with Cincinnati Bell
- QLINE – Detroit, MI: A 10-year, \$5 million sponsorship with Quicken Loans

7.2. CAPITAL INVESTMENT GRANT READINESS ASSESSMENT

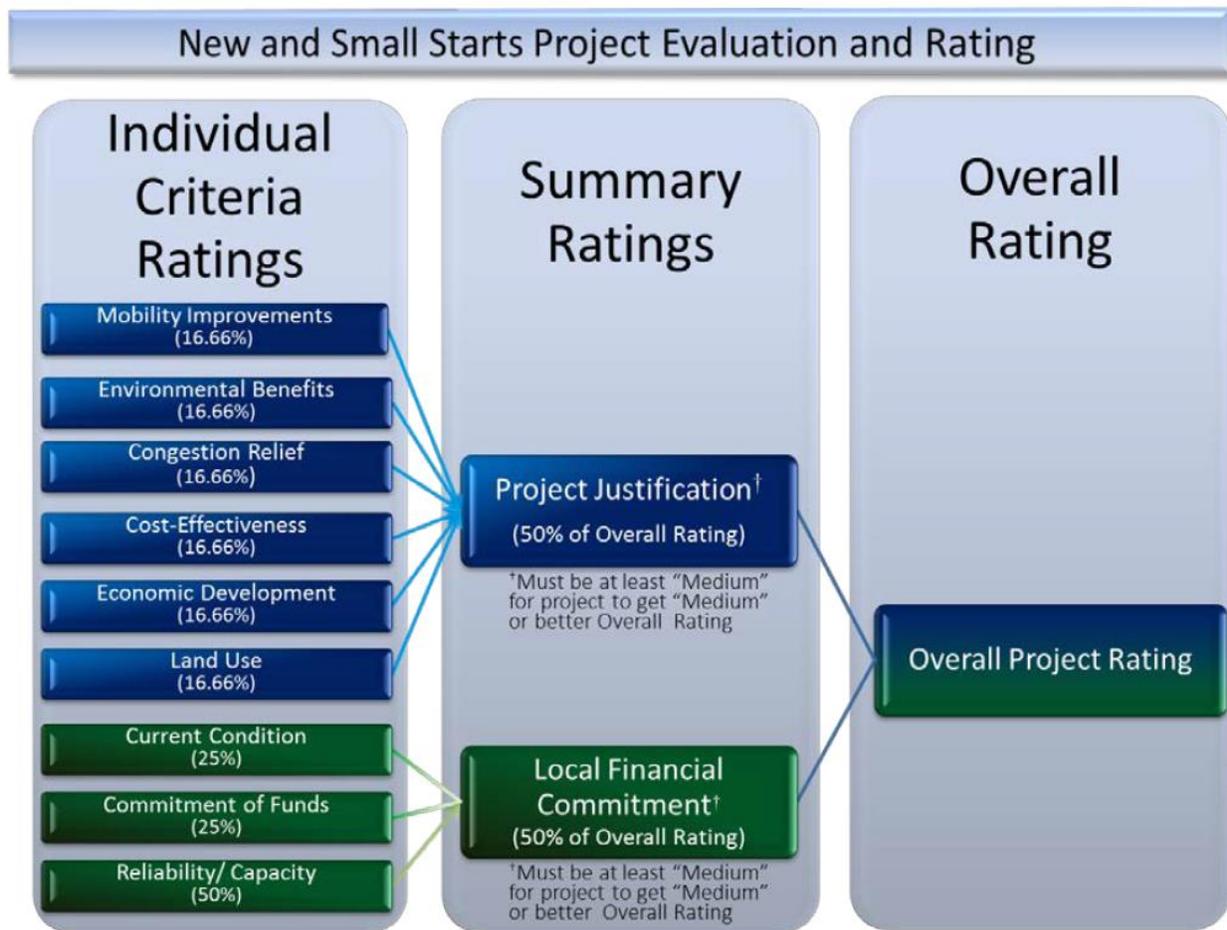
As detailed in **Section 7.1**, many communities and transit agencies across the country are pursuing CIG funding to fund their transit capital projects. This section provides a preliminary, planning-level assessment of the Glendale Streetcar's readiness for the CIG program. CIG Rating Criteria.

7.2.1. Capital Investment Grant Ratings

As part of the CIG process, project must submit project and community details to FTA for the calculation of ratings. CIG projects are evaluated and rated according to CIG criteria set forth in law. The criteria are summarized below:

- Project Justification Criteria
 - **Mobility Improvements:** Ridership on the project
 - **Environmental Benefits:** Emission benefits from VMT reduction
 - **Congestion Relief:** New transit trips resulting from the project
 - **Cost-Effectiveness:** Capital cost compared to ridership
 - **Land Use:** Existing population, employment, high trip generators, land use mix, pedestrian facilities, parking spaces, parking pricing strategies/costs, and legally binding affordable housing units
 - **Economic Development:** Qualitative criteria relating to plans and policies in place and past performance of those plans, including:
 - Plans and policies to increase corridor development; enhance the transit-friendly character; develop the pedestrian facilities, allowances for reductions in parking
 - Zoning ordinances that support increased density, transit-oriented character and reduced parking allowances
 - Tools to implement transit supportive policies
 - Performance of TOD plans and policies
- Local Financial Commitments Criteria
 - **Current Condition:** Existing condition of agency fleet, bond ratings, service history, etc.
 - **Commitment of Funds:** Level of local funding committed, budgeted, or planned
 - **Reliability/capacity:** Capacity to withstand shortfalls and reasonableness of financial plan
- Rating Calculation
 - The overall project is rated as a combination of the above detailed criteria using the weighting factors shown in **Figure 7-1**

Figure 7-1. Capital Investment Grant Weighting Factors



Source: FTA

FTA rates all of the individual criteria detailed above on 5-point scale: High, Medium-High, Medium, Medium-Low, and Low. Those individual criteria are then combined to arrive at Summary Ratings for both Project Justification and Local Financial Commitment. Those Summary Ratings are then combined into an Overall Project Rating. For a project to be eligible to receive CIG funding, the Overall Project Rating must be at least Medium.

Annual Submission

The program requires an annual report submission that is used by FTA to develop project ratings. Prior to submission of an annual report, the project must be accepted into project development and coordinate with FTA to prepare the project for an annual report submission. FTA typically accepts annual reports around late August or early September of each year.

7.2.2. Preliminary Ratings Assessment

This section evaluates Glendale Streetcar’s current position on the rating criteria detailed in **Section 7.2.1**. The ratings are preliminary assessments of how the Glendale Streetcar project would perform and future changes to project costs, funding or travel forecasts could change the ultimate rating received by the project. The preliminary ratings were developed utilizing

FTA guidance for the Small Starts program. The criteria for New Starts differ slightly but the general principles still apply.

Many rating criteria are dependent upon ridership forecasts. Given that streetcar projects typically focus on other outcomes such as economic development, in addition to ridership, it is often difficult for streetcar projects to achieve high ratings on criteria dependent upon ridership. However, recent streetcar projects such as the KC Streetcar Main Street Extension and the OC Streetcar all received sufficient CIG ratings for funding.

Mobility Improvements

Mobility improvements are represented by the total linked transit trips with a weight of two given to trips made by transit dependent persons. When using a current year and horizon year forecast the forecasts are reduced by 50% and added together to create the value used in the rating. This rating criteria is heavily dependent on ridership projections for the corridor.

While the Glendale Streetcar project has not completed an official Simplified Trips on Project Software (STOPS) Model for the corridor, the project would likely receive a LOW rating for Mobility Improvements. In order to achieve a rating greater than LOW, the project would likely need a forecast ridership of greater than 6,000 daily riders, depending on the number of trips made by transit dependent populations.

Preliminary Assessment of Mobility Improvements Rating: LOW

The preliminary rating of LOW is unlikely to change due to the ridership levels required for a MEDIUM-LOW.

Environmental Benefits

Environmental benefits are driven by VMT reduction from the project. The environmental benefits are monetized based on emission and safety values affected by the change in VMT. Those benefits are then compared to federal share of the project's costs. Project's that have a positive percentage (reduction in VMT) are rated as MEDIUM or higher. In order for any project to receive a rating below a MEDIUM, the project would need to lead to an increase in VMT. Due to a likely increase in transit trips, the Glendale Streetcar will reduce regional VMT. Based on available information, the project will likely receive a MEDIUM rating under the environmental benefits criterion.

Preliminary Assessment of Environmental Benefits Rating: MEDIUM

The project is unlikely to achieve a rating higher than MEDIUM, as it would require dramatic reductions in VMT.

Congestion Relief

Congestion relief is driven by new transit trips from the ridership forecasts, this rating utilizes 50% of the current and horizon year forecasts. The rating compares the new transit trips to the estimated federal match, meaning future decisions around funding could impact the rating choice. Given the rating breakpoints, the Glendale Streetcar project is likely to receive a rating of MEDIUM-LOW or MEDIUM.

Preliminary Assessment of Congestion Relief Rating: MEDIUM-LOW or MEDIUM

If the project ultimately requests limited federal funding, the congestion relief criterion could improve to MEDIUM or MEDIUM-HIGH.

Cost Effectiveness

Cost effectiveness is a measure that is primarily based on project cost (federal share) and partially on the project ridership. This rating utilizes 50% of both the current year and horizon year forecast. Based on initial assumptions, the cost effectiveness criterion will likely be a LOW or MEDIUM-LOW.

Preliminary Assessment of Cost Effectiveness Rating: LOW or MEDIUM-LOW

If the project ultimately requests limited federal funding, the congestion relief criterion could improve to MEDIUM.

Land Use

Land use is both a qualitative and quantitative criterion in the Small Starts submission. The primary quantitative measures used in the land use assessment are affordable housing share, population density, parking supply and corridor employment. It also considers station area development character and accessibility.

Land Use Quantitative Criteria

The Land Use criterion relies primarily on quantitative criteria for the ultimate rating. This section provides a preliminary assessment of quantitative criteria using readily available data. The data below was collected for a 0.5-mile study area around the project.

Station Area Development: The station area development criterion examines employment total and population density surrounding the project. The population density for the corridor is 16,673 people per square mile, which corresponds with HIGH rating (U.S. Census, 2015). While there is potential for the data to change if a Small Starts submission was completed in the future, it is likely the rating would remain HIGH.

Parking Supply: The parking supply criterion examines the cost and supply of parking in the project area Central Business District (CBD). The most recent available data on parking supply in the CBD is the *Downtown Parking Analysis* completed in April 2019 (City of Glendale). According to that analysis parking in the CBD costs on average \$13 per day, which is rated as MEDIUM-HIGH by FTA guidance.

While the downtown parking study area covers a smaller area than the entire downtown, the data is the best approximation for parking supply criteria at this time. Utilizing that smaller downtown study area and U.S. Census data on jobs from 2006-2010 already collected for the project, the number of parking spaces per employee is estimated at 0.51, a LOW rating. Future analysis should reexamine parking to ensure the most accurate representation of parking supply.

Affordable Housing Share: The final quantitative criterion of Land Use examines the proportion of legally binding affordability restricted housing in the project corridor compared to the proportion in LA County. Readily available data for the study area corridor was collected from the National Housing Preservation Database, which identified 1,011 legally binding affordable housing units in the study area out of 24,820 housing units. For Los Angeles County, data was collected from the *Los Angeles County Annual Affordable Housing Outcomes Report (2019)*, which found 111,220 affordable housing units compared to a total of 3.5 million housing units. Comparing the proportions of affordable housing, the study area corridor has a ratio of 1.32 compared to the county, for a rating of MEDIUM-LOW.

Land Use Qualitative Criteria

In addition to the quantitative criteria analyzed above, the Land Use Criterion also relies partially on qualitative discussion of various topics, as summarized below.

High Trip Generators: The Glendale Streetcar project serves numerous high trip generators. The project is adjacent to 10 major destinations including the Americana at Brand, Alex Theatre, several hotels, and the Glendale Memorial Hospital. The project serves Glendale's premier downtown office district and is adjacent to nearly 8.2 million square feet of commercial space. The project is adjacent to only 281 residential units since the current mix of uses along this corridor is primarily retail and office uses.

Land Use of Corridor: Brand Boulevard, in the downtown area, contains major retail and shopping centers and multi-story high-rise office uses north of Lexington Drive. Brand Boulevard, south of Colorado Street, is dominated by car dealership buildings and surface parking lots.

Central Avenue in the downtown area consists of several multi-story residential and mixed-use buildings intermixed with small-scale, single-story retail and service uses. Central Avenue, south of Colorado Street, is predominately single-story retail and service uses that line the street with some surface parking lots.

Recent major developments in the study area are concentrated in areas north of Colorado Street in the downtown area. Most developments within the past 5 years have been along Central Avenue as the corridor has seen several relatively new multi-story residential buildings, including the Modera, Altana, NEXT, Onyx, Lex on Orange, Legendary, and The Harrison. Brand Boulevard is experiencing similar development as 610 North Brand Boulevard was recently announced, a proposed 20-story, 240-unit residential apartment project replacing a parking structure.

Pedestrian Accommodations: Downtown Glendale and the study area corridor exhibit a robust pedestrian network. According to the *Glendale Citywide Pedestrian Plan* (City of Glendale, 2017), the study area corridor streets all contain sidewalks with numerous high-visibility crosswalks. The plan also details numerous policies and recommendations to improve the pedestrian experience in the study area and throughout Glendale.

Land Use Criteria Summary

Table 7-5. provides a summary of the quantitative land use criteria preliminary ratings.

Table 7-5. Land Use Criteria Summary

Criteria	Rating
Population Density	HIGH
Employment	HIGH
Parking Cost	MEDIUM-HIGH
Parking Supply	LOW
Affordable Housing	MEDIUM-LOW

Based on the quantitative ratings above, combined with the summary of qualitative information, the preliminary rating assigned to Land Use is MEDIUM.

In future analysis with updated and more precise data, the rating could change or be evaluated differently by FTA staff.

Economic Development

The economic development criterion requires a detailed assessment of various plans and policies. For the purposes of identifying a preliminary rating for economic development, a high-level qualitative examination of local plans, policies, and tools as well as their demonstrated performance was completed. A more robust assessment would be required for submittal of a New Starts or Small Starts application.

The Glendale Streetcar is fully integrated with the Glendale planning ecosystem. Coordinated land use and transportation planning is ongoing, and it is being carried out at multiple levels. Originating as a featured project in the SGCP (City of Glendale, 2018), the project features prominently in plans for improving mobility, connectivity, economic development in Glendale.

Transit Supportive Corridor Policies (Transit, TOD Friendly, Ped Facilities, Parking Policies)

- *South Glendale Community Plan (2018)*: The plan involves transforming corridors like Central Avenue, Colorado Street, Broadway and Glendale Avenue to be higher-density, mixed-use buildings. The plan envisions these higher-density areas will be able to utilize the proposed transit routes. The growth (predicted as 7,000 – 9,000 units) of South Glendale is dependent on expanding public transportation systems. As such, the plan promotes the Brand Boulevard streetcar line and Metro Light Rail extension to provide transportation options throughout South Glendale.
- *Downtown Specific Plan (2006)*: The plan has 10 goals that revolve around making Downtown Glendale a vibrant urban center with shopping, dining, working, living, entertainment and cultural opportunities all in walking distance. The plan aims to enhance the regional transit system, improve guidance like cross walks, signage, lighting; integrate pedestrian and vehicular areas and orientation of those areas; and promotes new residential development in areas that have high walkability to many destinations.

- *Downtown Mobility Study (2007)*: The goal of the study is to enhance downtown development while ensuring the mobility and accessibility demands are met and not infringing on the livability of Glendale. The plan places great emphasis on promoting downtown access via regional transit systems. The study recognizes a lack in regional transportation for downtown Glendale and if to expect increases in downtown development and attraction the transportation and downtown accessibility issues need to be addressed. Streetcars were identified by the study as viable transit system for Downtown Glendale to adopt.
- *Glendale Citywide Pedestrian Plan (2017)*: The plan focuses on the actions needed to make walking in Glendale safer and more comfortable. The plan identifies a list of high-priority initiatives on critical programs, policies, and procedures.

Supportive Zoning

Primary zoning categories within the corridor outside of the *Downtown Specific Plan* include:

- High-density residential
- Medium-high density residential
- Commercial service

All of the above zoning categories align with transit supportive land uses and the goals and policies detailed in the city's plans and policies.

Within the downtown area, the *Downtown Specific Plan* governs the zoning categories. The area east of Central Avenue, between Doran Street and Broadway, is envisioned as a new, urban housing development comprised of mixed-use or free-standing residential buildings. Maximum height in the district is between six (existing) and 12 stories (with proposed incentive bonuses). The area to the west of Central Avenue, which is currently a mix of single-family and small apartments, is noted as Transitional. The plan envisions this area will transition into mid-rise mixed-use development, with an emphasis on ground floor commercial uses along Central Avenue and a maximum height of four to six stories.

Near SR-134, the Gateway District has the highest maximum height allowable in Glendale with an existing maximum height of 18 stories and up to 25 stories with proposed incentives. Areas surrounding the Alex Theatre on Brand Boulevard are expected to remain the same style and scale with height limits at four to six stories. The Broadway Center District (southwest of Brand Boulevard and Wilson Avenue) is highlighted as possible redevelopment, with the opportunity for high-rise residential, office, or mixed-use development. The Maryland District (southeast of Brand Boulevard and Wilson Avenue) is home to Downtown's two more recent mixed-use commercial developments (The Exchange and The Marketplace). The district aims to encourage the concentration of arts, cultural, and entertainment venues and associated uses. Proposed height limits in the Maryland District range from four to six stories.

Implementation Tools

Glendale has a variety of tool to help implement transit-supportive policies, including:

- **General Outreach**: The City of Glendale has actively engaged stakeholders, agencies and the public through a number of planning efforts outside of this feasibility study, including the

SGCP, Downtown Specific Plan and the *General Plan*. In general, the community has shown support for transit supportive policies.

- Incentives: Several development incentives are available in the streetcar corridor to spur new development in accordance with the city's transit-supportive plans, including development density bonuses.
- Streetcar Public Input: As a part of the feasibility study, the city of Glendale established a web site and conducted a survey to engage the public for feedback and support of the Glendale Streetcar.
- Other: Other tools to implement transit-supportive policies should be identified and developed in future phases to support implementation and improve the economic development ratings assessment.

Performance of Plans/Policies

Glendale has a variety of demonstrated cases of development affected by transit supportive policies. Downtown development is guided by local plans including the *Downtown Specific Plan* and *SGCP*. These plans provide the policy basis for higher density, mixed-use and walkable developments that can support transit investments.

A few examples of recent transit-supportive developments include:

- NEXT on Lex: a mixed-use, multifamily, transit-oriented development with 494 units and along the streetcar study corridor.
- Onyx: a mixed-use development with 84 rental apartments directly along the streetcar corridor.
- Lex on Orange: 307-unit mixed-use apartment development
- Legendary: 80-unit condominium development with a focus on walkability
- 610 North Brand Boulevard: 35-story, 348-unit residential apartment project replacing a parking structure. Five percent of the unit mix will be low-income

Impact of Transit Investment on Development

The presence of the streetcar along and near Central Avenue could help sustain many new developments that have occurred in the past 5 to 10 years and encourage additional investment along this corridor. Based on land use plans and analysis, Central Avenue appears to have additional redevelopment capacity.

Local plans promote the continuation of corporate headquarters and the development of mixed-use and residential buildings and street-level service and retail businesses to enhance the current character of the Brand Boulevard corridor. Redevelopment and/or a change in character along Brand Boulevard should be consistent with local plans. Brand Boulevard is a thriving, active commercial corridor with a unique character. By improving transit service with the addition of a streetcar, it will support the existing uses and help facilitate new higher density uses in accordance with local plans and development regulations. Future analyses should examine specific opportunities for development along the streetcar corridor.

Affordable Housing Policies

Glendale has access to a variety of different programs to support affordable housing, a few examples are noted below:

- **Affordable Housing Commercial Development Impact Fee:** Applies a fee of \$4 per square foot of gross floor area for all citywide commercial projects 1,250 square feet or greater. The funds from this fee are designated for affordable housing.
- **Inclusionary Zoning Ordinance:** Fifteen percent (15%) of the total units in an otherwise market-rate rental project must be affordable to lower income (60% Area Median Income) individuals or families.
- **Local Sales Tax:** Glendale has recently Committed over \$24 million in newly approved local Measure S sales tax proceeds towards future affordable housing projects and programs

Given the qualitative nature of the economic development criterion and other community ratings, economic development is assigned a MEDIUM in this preliminary assessment.

Future phases should examine the pieces of the economic development criterion and identify policies and plans to highlight in addition to identifying new policies and plans that could further increase the potential rating.

Local Financial Commitment

FTA evaluates projects applying for New Starts and Small Starts grant funding based on two sets of criteria:

1. Project justification
2. Local financial commitment

The local financial commitment is based on the following three components:

1. The current financial condition of the project sponsor (25% of the local financial commitment)
2. The commitment of non-federal funds (25% of the local financial commitment)
3. The project sponsor's reliability and capacity to operate and maintain the project, or the "reasonableness of the financial plan." an acceptable degree of local financial commitment (the remaining 50%).

At this early stage of project development, some of these criteria are unknown. This section provides a high-level overview of the three criteria that make up the local financial commitment.

Current Capital and Operating Condition (25% of Local Financial Commitment Rating)

The current financial condition is assessed via five measures:

- Average bus fleet age
- Ratio of current assets to current liabilities
- Recent bond ratings
- Historic cash flow
- Recent service cutbacks

Based on readily available data via the National Transit Database and Glendale Comprehensive Annual Financial Reports, the current financial condition is likely to be assessed as a MEDIUM or MEDIUM-HIGH.

Commitment of Funds (25% of Local Financial Commitment Rating)

This rating criterion measures the amount of non-federal funding committed at the time of submission. At this early stage of development, this rating is unable to be assessed. **Table 7-6.** provides a summary as to how FTA currently evaluates the commitment of funding criterion.

Table 7-6. Commitment of Funds Ratings

Rating	Criterion Description
High	<ul style="list-style-type: none"> At least 75% of the Non-Section 5309 capital funds are committed or budgeted. At least 75% of the funds needed to operate and maintain the proposed transit system in the opening year of the project are committed or budgeted.
Medium-High	<ul style="list-style-type: none"> At least 50% of the Non-Section 5309 capital funds are committed or budgeted. At least 50% of the funds needed to operate and maintain the proposed transit system in the opening year of the project are committed or budgeted.
Medium	<ul style="list-style-type: none"> At least 30% of the Non-Section 5309 capital funds are committed or budgeted. At least 30% of the funds needed to operate and maintain the proposed transit system in the opening year of the project are committed or budgeted.
Medium-Low	<ul style="list-style-type: none"> At least 10% of the Non-Section 5309 capital funds are committed or budgeted. While no additional operating and maintenance funding has been committed, a reasonable plan to secure funding commitments has been presented
Low	<ul style="list-style-type: none"> Less than 10% of the Non-Section 5309 capital funds are committed or budgeted. The applicant does not have a reasonable plan to secure operating and maintenance funding.

Source: Final Interim Policy Guidance. Federal Transit Administration Capital Investment Grant Program. June 2016

Reasonableness of the Financial Plan (50% of Local Financial Commitment Rating)

Similar to the Commitment of Funds criterion developed above, this criterion is largely dependent on the ultimate financial plan that is developed to fund the Glendale Streetcar. **Table 7-7.** provides a summary as to how FTA currently evaluates the Reasonableness of the Financial Plan criterion.

Table 7-7. Financial Plan Criteria

Rating	Criterion Description
High	<ul style="list-style-type: none"> The financial plan contains very conservative planning assumptions and cost estimates when compared with recent historical experience.

Rating	Criterion Description
	<ul style="list-style-type: none"> The applicant has access to funds via additional debt capacity, cash reserves, or other committed funds to cover cost increases or funding shortfalls equal to at least 50% of estimated project cost and 50% (6 months) of annual system wide operating expenses.
Medium-High	<ul style="list-style-type: none"> The financial plan contains conservative planning assumptions and cost estimates when compared with recent historical experience. The applicant has access to funds via additional debt capacity, cash reserves, or other committed funds to cover cost increases or funding shortfalls equal to at least 25% of estimated project cost and 25% (3 months) of annual system wide operating expenses.
Medium	<ul style="list-style-type: none"> The financial plan contains planning assumptions and cost estimates The applicant has access to funds via additional debt capacity, cash reserves, or other committed funds to cover cost increases or funding shortfalls equal to at least 15% of estimated project cost and 12% (1.5 months) of annual system wide operating expenses.
Medium-Low	<ul style="list-style-type: none"> The financial plan contains optimistic planning assumptions and cost estimates when compared to recent historical experience. The applicant has access to funds via additional debt capacity, cash reserves, or other committed funds to cover cost increases or funding shortfalls equal to at least 10% of estimated project cost and 8% (1 month) of annual system wide operating expenses.
Low	<ul style="list-style-type: none"> Financial plan contains planning assumptions and cost estimates that are far more optimistic than recent history suggests. The applicant has a reasonable plan to cover only minor (less than 10%) capital cost increases or funding shortfalls. Projected operating cash balances are insufficient to maintain balanced budgets,

Source: Final Interim Policy Guidance. Federal Transit Administration Capital Investment Grant Program. June 2016

7.2.3. CIG Preliminary Ratings Assessment

The sections above present a preliminary assessment of the ratings if the Glendale Streetcar project pursued a Small Starts Grant. **Table 7-8** summarizes the preliminary assessment of each criteria.

Table 7-8. Preliminary CIG Ratings

Criteria	Preliminary Rating	Potential for change
Project Justification	Medium-Low	Could rise depending on factors below
Mobility Improvements	Low	Unlikely, largely based on project ridership
Environmental Benefits	Medium	Unlikely, largely based on reduction in VMT

Congestion Relief	Medium-Low	Could rise to Medium depending on results of future analyses
Cost Effectiveness	Low	Could rise depending on ultimate federal share
Land Use	Medium	Could rise with updated data
Economic Development	Medium	Could rise with adoption of new policies
Local Financial Commitment	Unknown/TBD	Could rise depending on factors below
Current Financial Condition	Medium	Could rise based on strong financial performance in future years
Commitment of Funds	Unknown/TBD	Dependent on commitment at time of ratings submission.
Reasonableness of Financial Plan	Unknown/TBD	Dependent on commitment at time of ratings submission

TBD = to be determined

The preliminary assessment projects a Medium-Low rating for the Project Justification criteria, which would not allow the project to advance into funding. As the project continues to advance, there will be many additional opportunities to improve the ratings. As the project progresses, opportunities to reduce project costs without sacrificing ridership should be pursued, which would improve the cost effectiveness ratings. Additionally, decisions around funding and the federal share could have a great impact on the ratings.

The City of Glendale has some transit-supportive policies regarding parking, affordable housing and land use. As the project progresses, if more of these policies are enacted and implemented, the economic development rating would likely be improved. However, to achieve an improved rating the city would need to demonstrate additional examples of adopted and implemented transit supportive plans and policies.

The ratings provided at this phase of the project should not be considered final. It will be important to continually re-evaluate as the project progresses.

7.3. APPROVALS AND ACTIONS REQUIRED

While a full assessment of approvals required will be completed during the environmental and construction preparation phases of the project, the following section presents a preliminary summary of approvals and actions required to implement the project.

7.3.1. Permits and Approvals

- Federal Transit Administration: Review and approval will be required if the project uses any federal funding.
- California Public Utilities Commission: Approval regarding safety of rail crossings; along with design and operational oversight

- City of Glendale Public Works Department: Approval of all engineering drawings and work within the public right-of-way and any traffic signal changes
- City of Glendale City Council: Approvals related to Locally Preferred Alternative, Contracts and funding
- U.S. Army Corps of Engineers: Coordination and potential permitting for crossing of Verdugo Wash
- California DOT (Caltrans): Permits or approvals for traffic operations at SR 134 ramps and potential impacts to structures
- Metrolink: Coordination and potential approval of work near Metrolink Station

7.3.2. Actions to Implement

This feasibility study has developed a bold and transformative project for downtown Glendale and implementing the streetcar project will be a complex endeavor that will require a strong lead local agency that is supported by strong local stakeholders.

It is recommended that the City Council create a committee or organization that will meet regularly to discuss plan implementation progress. The committee should assist the City Council with key decisions at project milestones and help identify funding sources. Public and stakeholder input should also be an integral part of the ongoing planning and design efforts for the project.

Table 7-9 summarizes the project development milestones for the project through construction. It also identifies key action steps that must be implemented for each milestone.

Table 7-9. Implementation Actions

Project Milestone	Key Steps
Initial Study, supported by conceptual engineering	Select and contract with a consultant to prepare an Initial Study under the CEQA, including 5% engineering design to establish project footprint
LPA Approval	Finalize details of preferred alignment (e.g., stations, guideway design, OMF location). City council approves LPA.
CIG Decision	Determine if the project will seek federal funding through the CIG program. If the project will, submit a project development entry letter to FTA that identifies funding for initial project development, an overall project cost estimate, and a schedule.
CEQA and NEPA Documentation, supported by advanced conceptual engineering	Select and contract with a consultant to conduct environmental study of the project in accordance with CEQA and the NEPA, including 15% engineering plans for track, OCS, OMF, utilities and all other streetcar improvements.
Identify and approve local construction funding	Work with local, regional and state partners to identify local funds. Most federal applications require a minimum of 20% local funds that are committed at the time of application. Federal applications with at least a 50% committed local match are more competitive.

Project Milestone	Key Steps
Identify non-CIG federal construction funding	If the project pursues federal funding other than or an addition to CIG funding, other smaller funding sources could be pursued such as RAISE grants.
Apply for entry into Engineering	Requires Project Management Plan, cost estimate, schedule, financial plan, project delivery method, and FTA CIG rating. Federal funding amount is locked in at this time.
Prepare final design plans	Select and contract with a consultant to develop final design plans for track, OCS, OMF, utilities and all other streetcar improvements.
Apply for FFGA	Need final FTA rating, final financial plan with sufficient local funding.
Construct project infrastructure	Select contractor to construct the streetcar project. Cannot execute contract until FFGA is signed.
Operate the project	Select and contract with an operator for testing, start-up and revenue services.

CEQA = California Environmental Quality Act

FFGA = Full Funding Grant Agreement

LPA = Locally Preferred Alternative

NEPA = National Environmental Policy Act

The actions above reference major milestones in the development of the project. Throughout the course of the project, various smaller milestones, approvals and actions will be required to advance the project.

7.4. IMPLEMENTATION TIMELINE

Given the current progress and pace of the feasibility study, the schedule, shown in **Figure 7-2**, shows a timeline for the implementation milestones to operation. Although no timeline for the project has been established, the schedule incorporates typical durations based on similar projects and timeframes. The schedule should be continually updated throughout the project.

Figure 7-2. Implementation Schedule

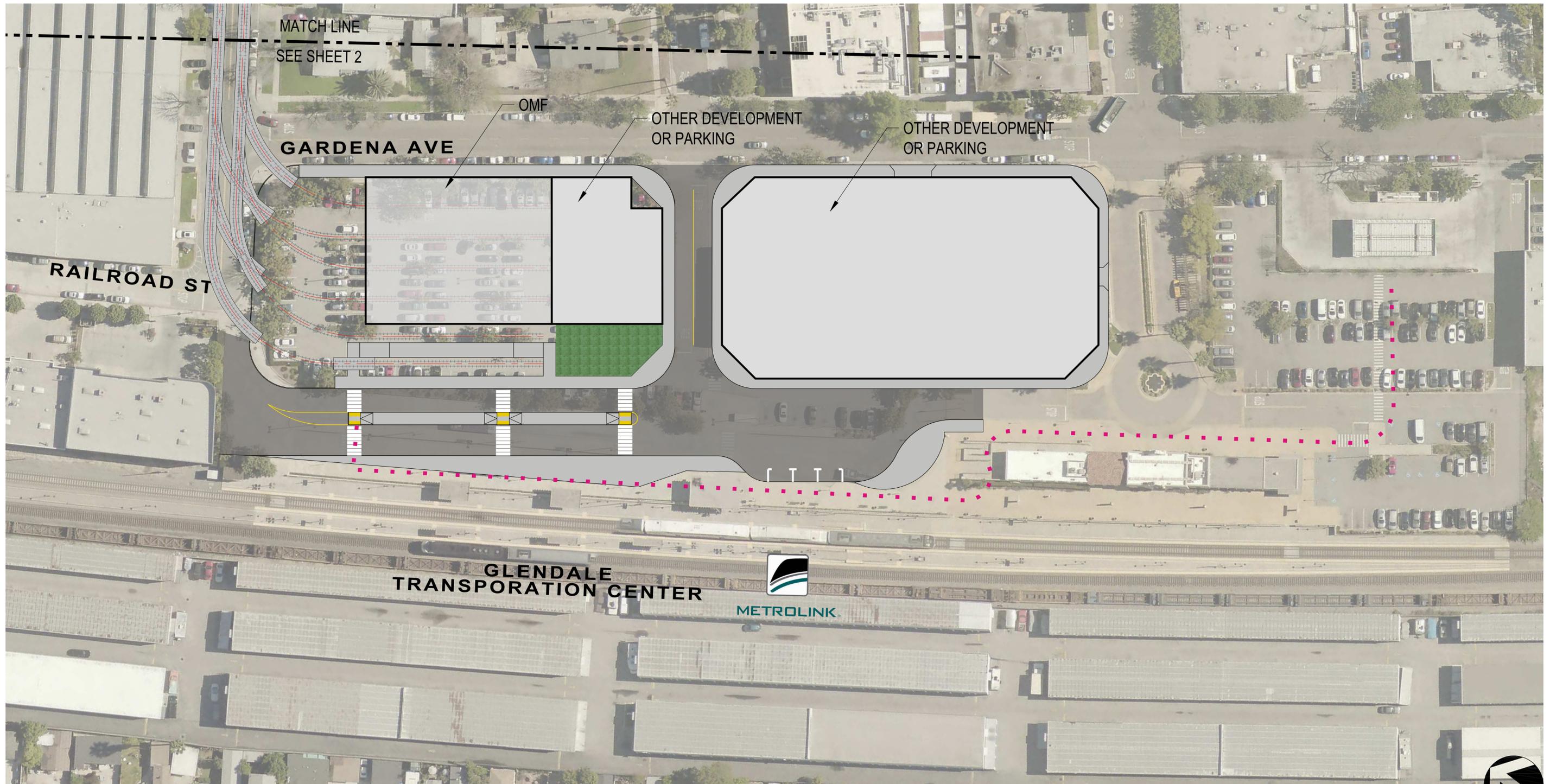
Project Milestone	Duration	2022	2023	2024	2025	2026	2027	2028
Initial Study/Conceptual Engineering	6 months	■						
LPA Approval	2 months		■					
CIG Decision	3 months		■					
CEQA/NEPA Documentation/ACE	14 months		■	■	■			
Identify Local Construction funding	8 months			■	■			
Identify Federal Construction Funding	6 months			■	■			
Prepare Final Design Plans	24 months			■	■	■		
FFGA	12 months				■	■		
Construction	30 months					■	■	■
Operations (Testing, Start-up, Revenue Service)	6 months							■

8. REFERENCES

- California State Transportation Agency (CalSTA). 2021. *Transit and Intercity Rail Capital Program*. <https://calsta.ca.gov/subject-areas/transit-intercity-rail-capital-prog>. Accessed October.
- City of Glendale. 2012. *City of Glendale Bicycle Transportation Plan*. September.
- City of Glendale. 2019. *Downtown Specific Plan*. March.
- City of Glendale. 2017. *Glendale Citywide Pedestrian Plan*. September.
- City of Glendale. 2021. *Glendale Citywide Pedestrian Plan*. March.
- City of Glendale. 2021. *Glendale Streetcar Design Report*. Anticipated submission date: November.)
- City of Glendale. 2018. *South Glendale Community Plan*. January.
- City of Glendale. 2018. *South Glendale Community Plan Environmental Impact Report*. January.
- City of Glendale. 2019. *Downtown Parking Analysis*. April.
- City of Glendale. 2021. *West Glendale Sustainable Transportation and Land Use Study*. westglendalestudy.com. Accessed October 2021.
- Detroit Free Press. 2017. "Ready for the QLINE? Detroit's streetcar gets ready to debut." May.
- Federal Transit Administration (FTA). 2020. *Fixed Guideway Capital Investment Grants Fact Sheet*. February. https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/5309_Capital_Investment_Grant_Fact_Sheet.pdf
- Los Angeles County. 2019. *Los Angeles County Annual Affordable Housing Outcomes Report*.
- Los Angeles County Metropolitan Transportation Authority (Metro). 2014. *First Last Mile Strategic Plan*. March.
- Los Angeles County Metropolitan Transportation Authority (Metro). *2020 Metro Funding Source Guide*.
- Los Angeles County Metropolitan Transportation Authority. *Proposition A & C and Measure R Sales Taxes*. <https://www.metro.net/about/financebudget/taxes/>
- Potawatomi Hotel & Casino. 2021. The Hop Streetcar: About. <https://thehopmke.com/about/#faq>. Accessed October.
- Transportation Research Board (TRB). 2016. *Guide to Value Capture Financing for Public Transportation Projects*.
- U.S. Census. 2015. American Community Survey 2015 5-Year Estimates.
- U.S. DOT. 2021. *RAISE Discretionary Grants*. <https://www.transportation.gov/RAISEgrants>. Accessed October.
- Wisconsin Policy Forum (WPF). 2019. *On the Right Track?* September.

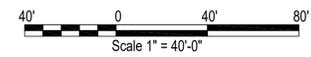
Appendix A

Conceptual Plans



LEGEND

..... PUBLICLY ACCESSIBLE WALKWAY

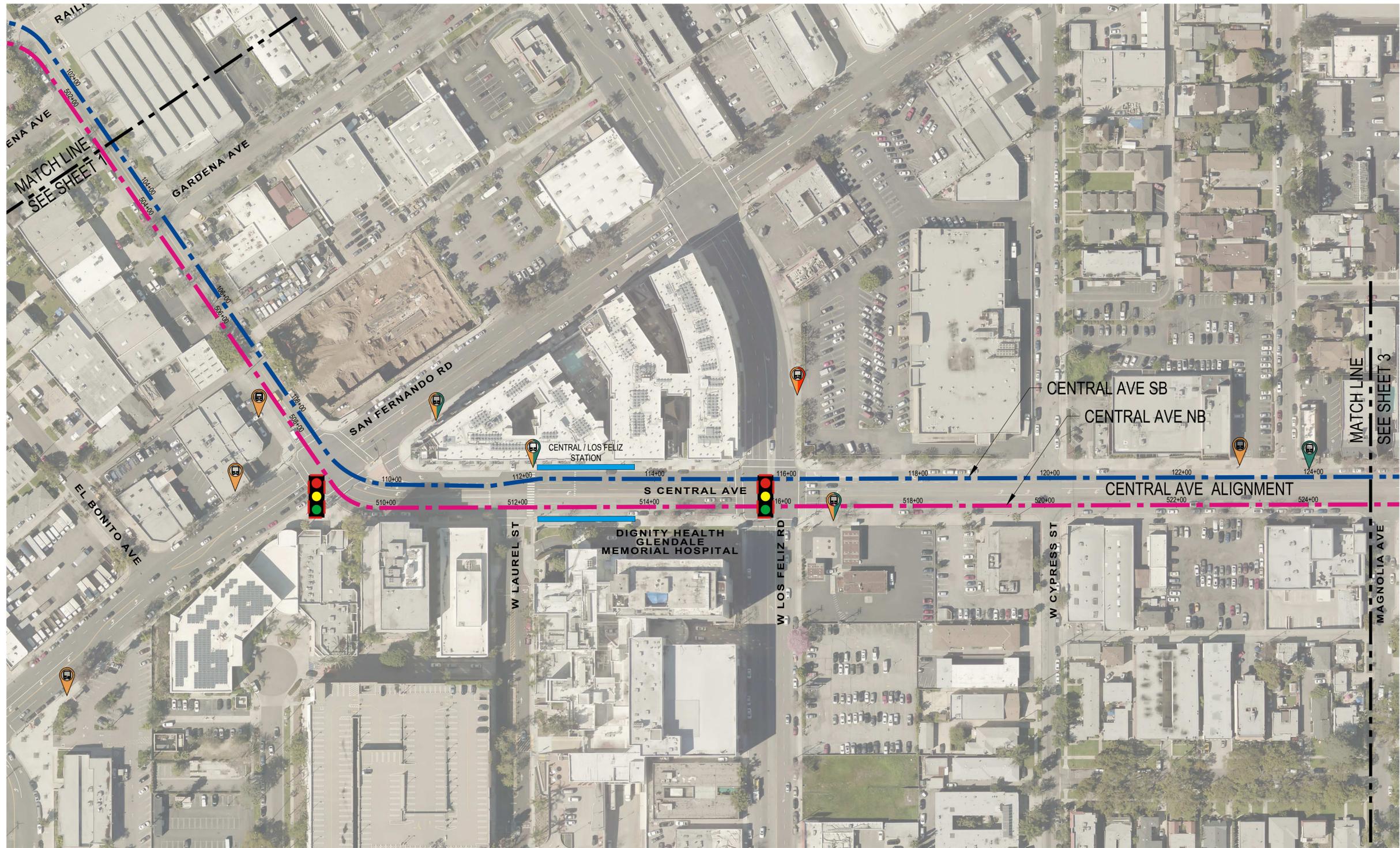


Glendale Streetcar Feasibility Study

GTC / Maintenance Facility
Sheet 1



HNTB

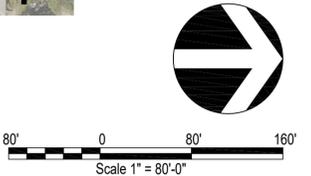


LEGEND

-  PREFERRED STATION LOCATION
-  OPTIONAL STATION LOCATION
-  PUBLICLY ACCESSIBLE WALKWAY

-  MODIFY EXISTING TRAFFIC SIGNAL FOR STREETCAR OPERATIONS

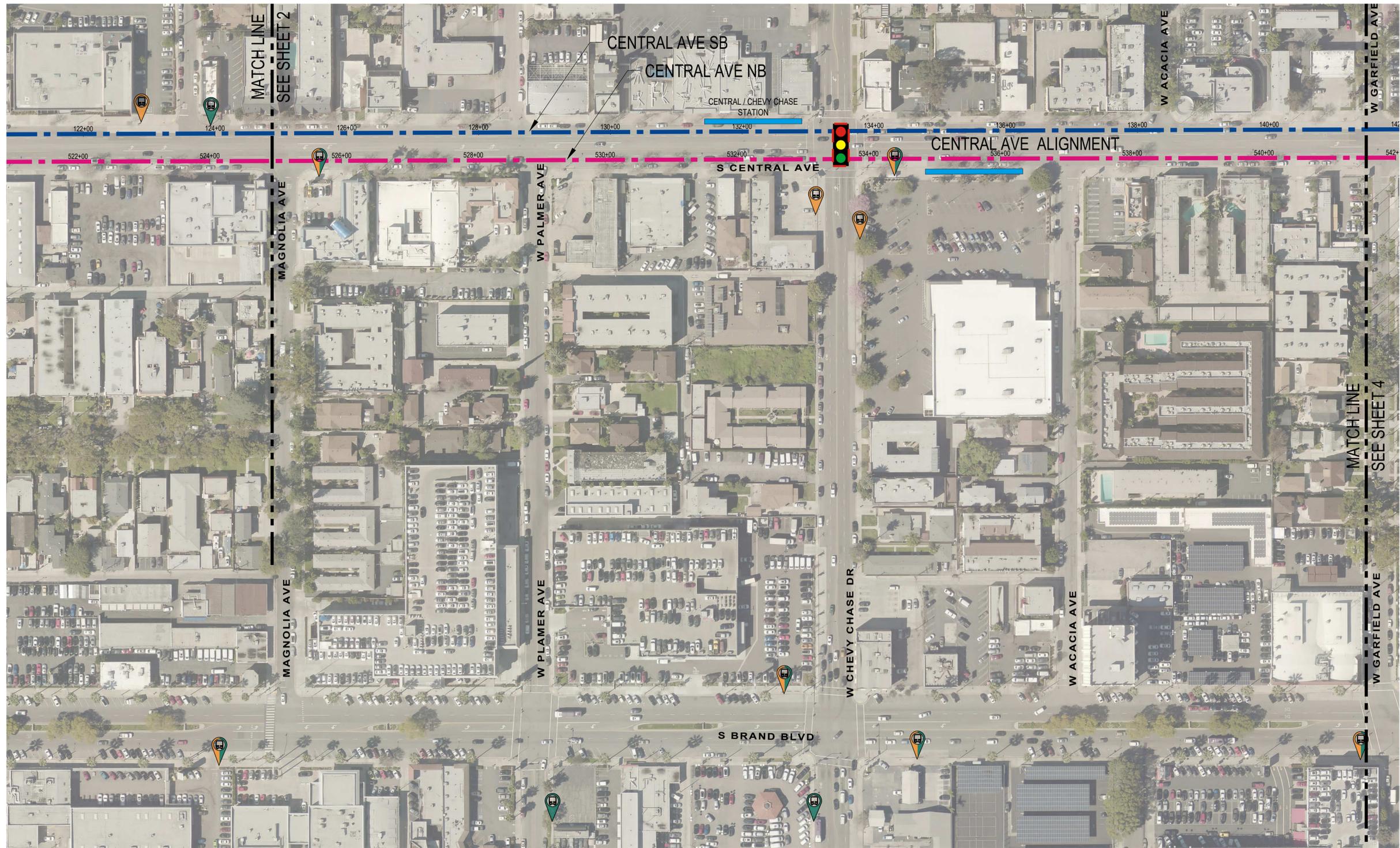
-  MTA STOP
-  BEE LINE STOP
-  MTA/BEE STOP
-  MTA/LADOT STOP



Glendale Streetcar Feasibility Study

Central Ave between San Fernando Rd to Magnolia Ave
Sheet 2



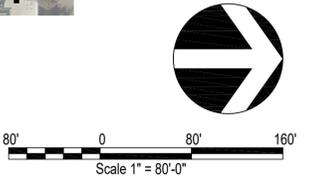


LEGEND

-  PREFERRED STATION LOCATION
-  OPTIONAL STATION LOCATION
-  PUBLICLY ACCESSIBLE WALKWAY

-  MODIFY EXISTING TRAFFIC SIGNAL FOR STREETCAR OPERATIONS

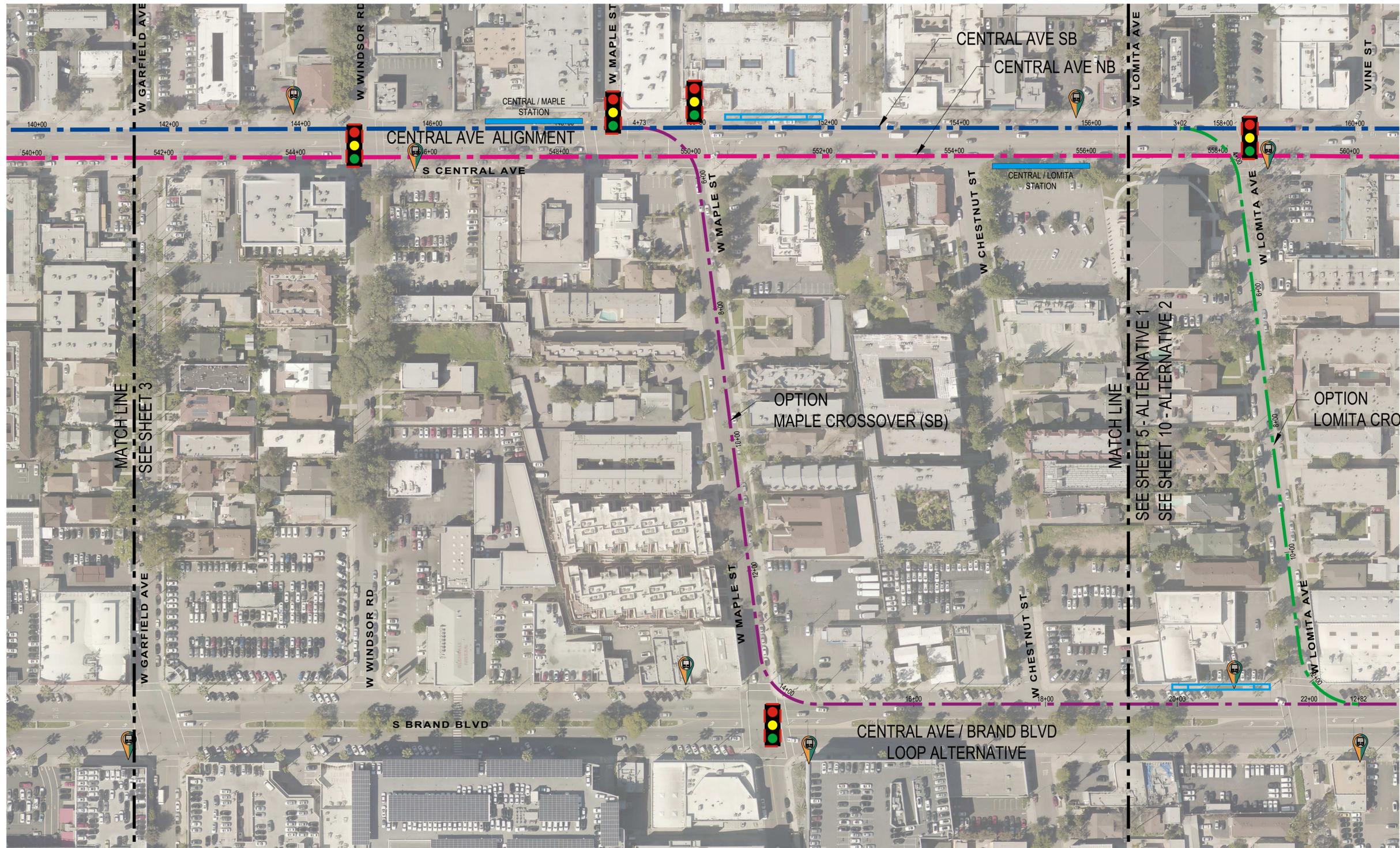
-  MTA STOP
-  BEE LINE STOP
-  MTA/BEE STOP
-  MTA/LADOT STOP



Glendale Streetcar Feasibility Study

Central Ave between San Fernando Rd to Magnolia Ave
Sheet 3



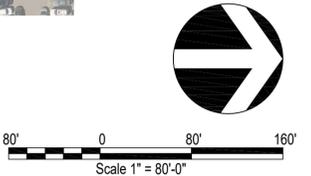


LEGEND

-  PREFERRED STATION LOCATION
-  OPTIONAL STATION LOCATION
-  PUBLICLY ACCESSIBLE WALKWAY

-  MODIFY EXISTING TRAFFIC SIGNAL FOR STREETCAR OPERATIONS

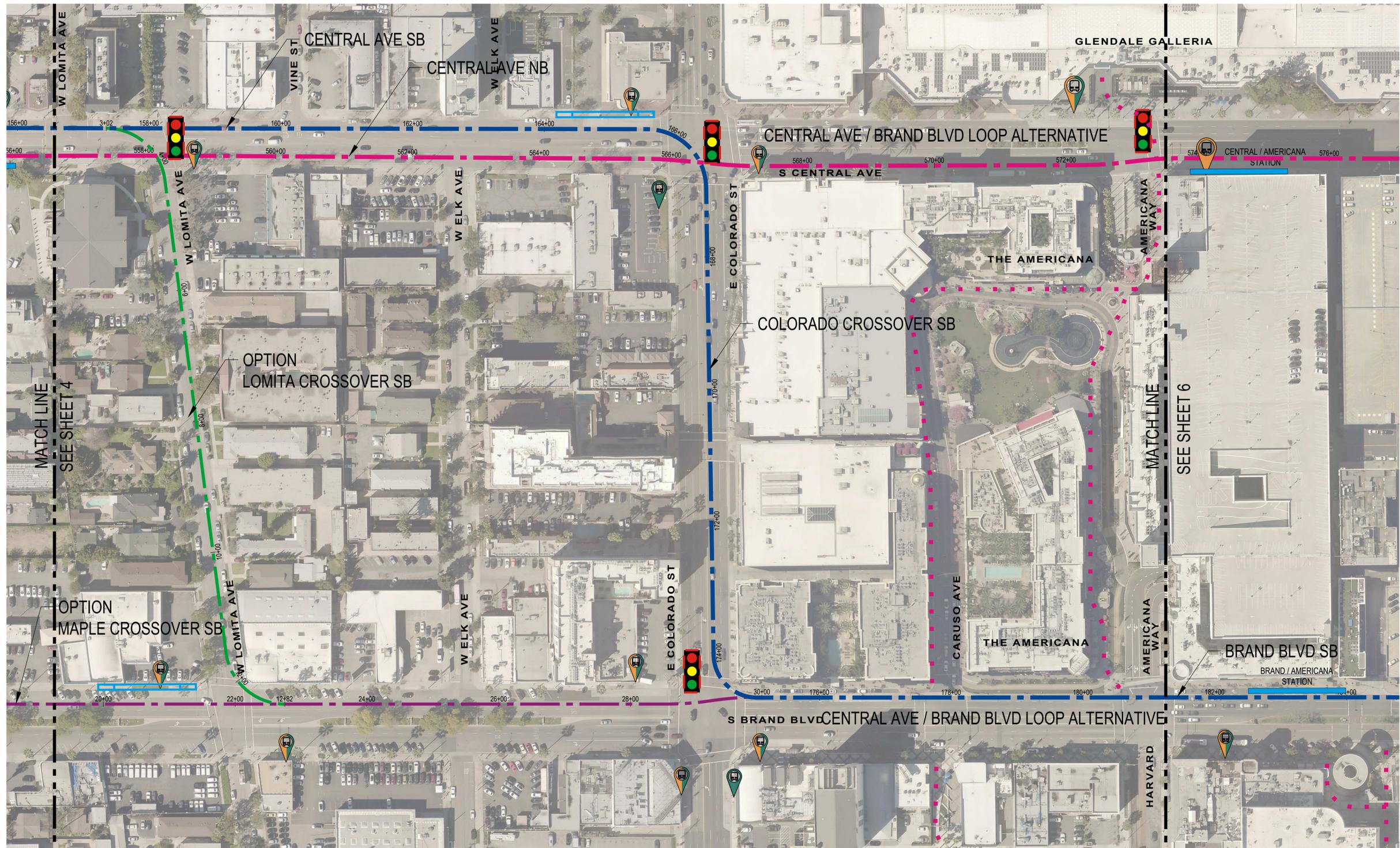
-  MTA STOP
-  BEE LINE STOP
-  MTA/BEE STOP
-  MTA/LADOT STOP



Glendale Streetcar Feasibility Study

Central Ave between W Garfield Ave to W Lomita Ave
Sheet 4



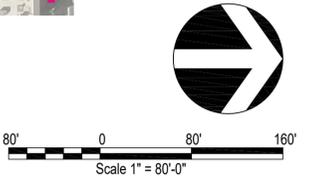


LEGEND

-  PREFERRED STATION LOCATION
-  OPTIONAL STATION LOCATION
-  PUBLICLY ACCESSIBLE WALKWAY

-  MODIFY EXISTING TRAFFIC SIGNAL FOR STREETCAR OPERATIONS

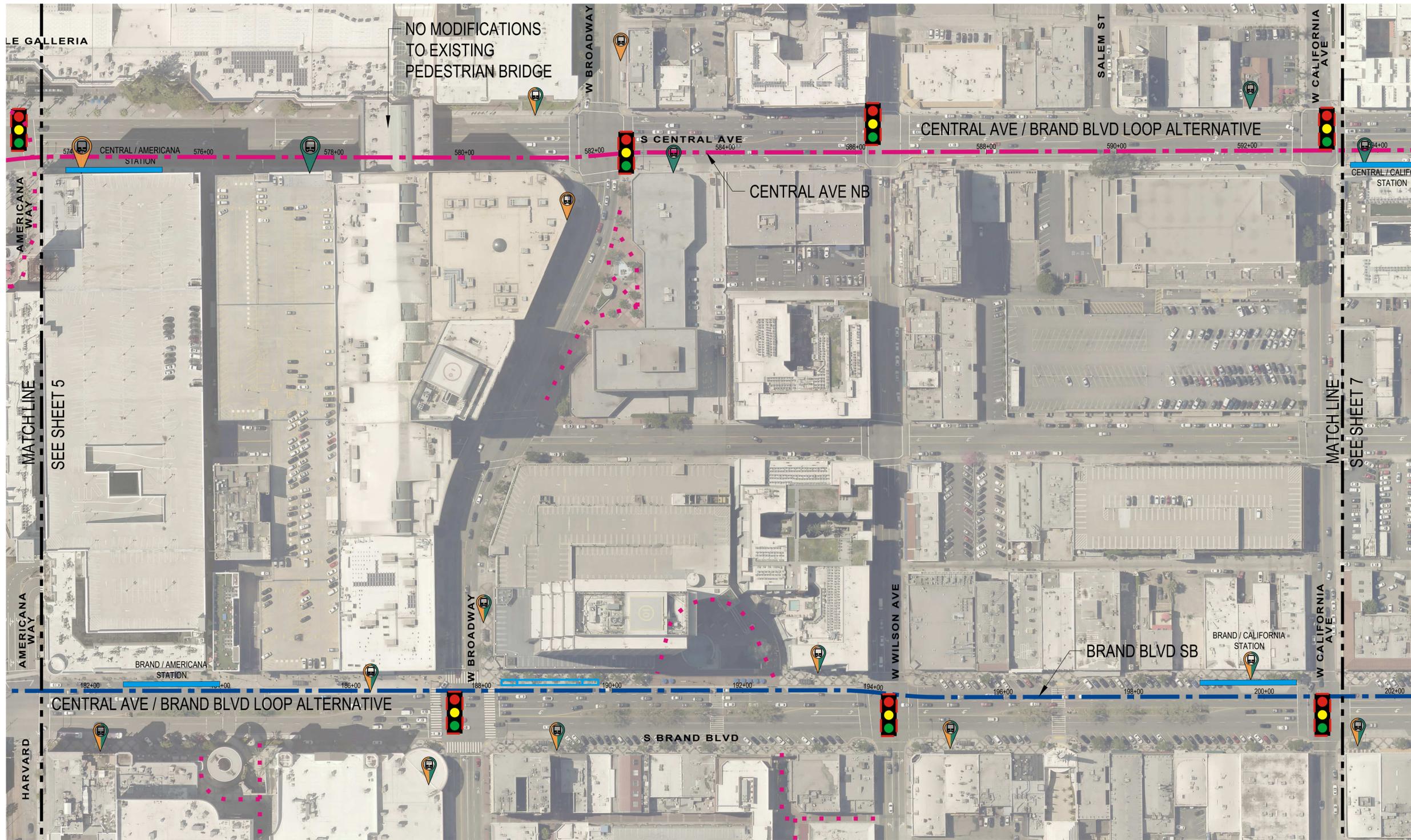
-  MTA STOP
-  BEE LINE STOP
-  MTA/BEE STOP
-  MTA/LADOT STOP



Glendale Streetcar Feasibility Study

Alternative 1 "Central / Brand Loop" between W Lomita Ave to Americana Way
Sheet 5



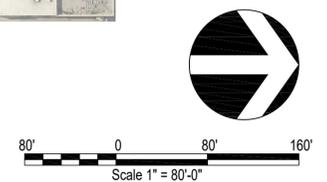


LEGEND

-  PREFERRED STATION LOCATION
-  OPTIONAL STATION LOCATION
-  PUBLICLY ACCESSIBLE WALKWAY

-  MODIFY EXISTING TRAFFIC SIGNAL FOR STREETCAR OPERATIONS

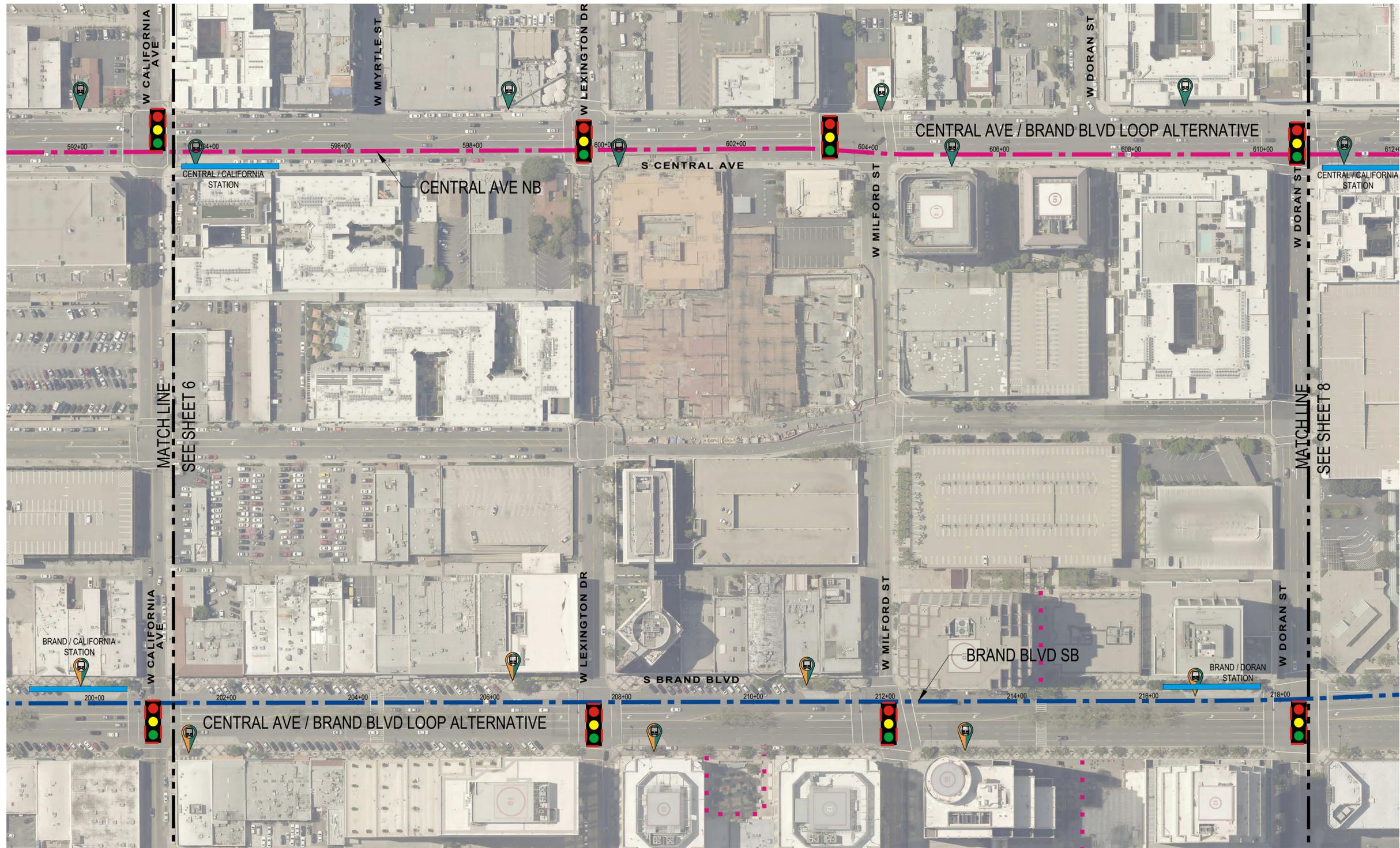
-  MTA STOP
-  BEE LINE STOP
-  MTA/BEE STOP
-  MTA/LADOT STOP



Glendale Streetcar Feasibility Study

Alternative 1 "Central / Brand Loop" between Americana Way to W California Ave
 Sheet 6



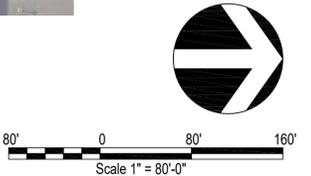


LEGEND

-  PREFERRED STATION LOCATION
-  OPTIONAL STATION LOCATION
-  PUBLICLY ACCESSIBLE WALKWAY

-  MODIFY EXISTING TRAFFIC SIGNAL FOR STREETCAR OPERATIONS

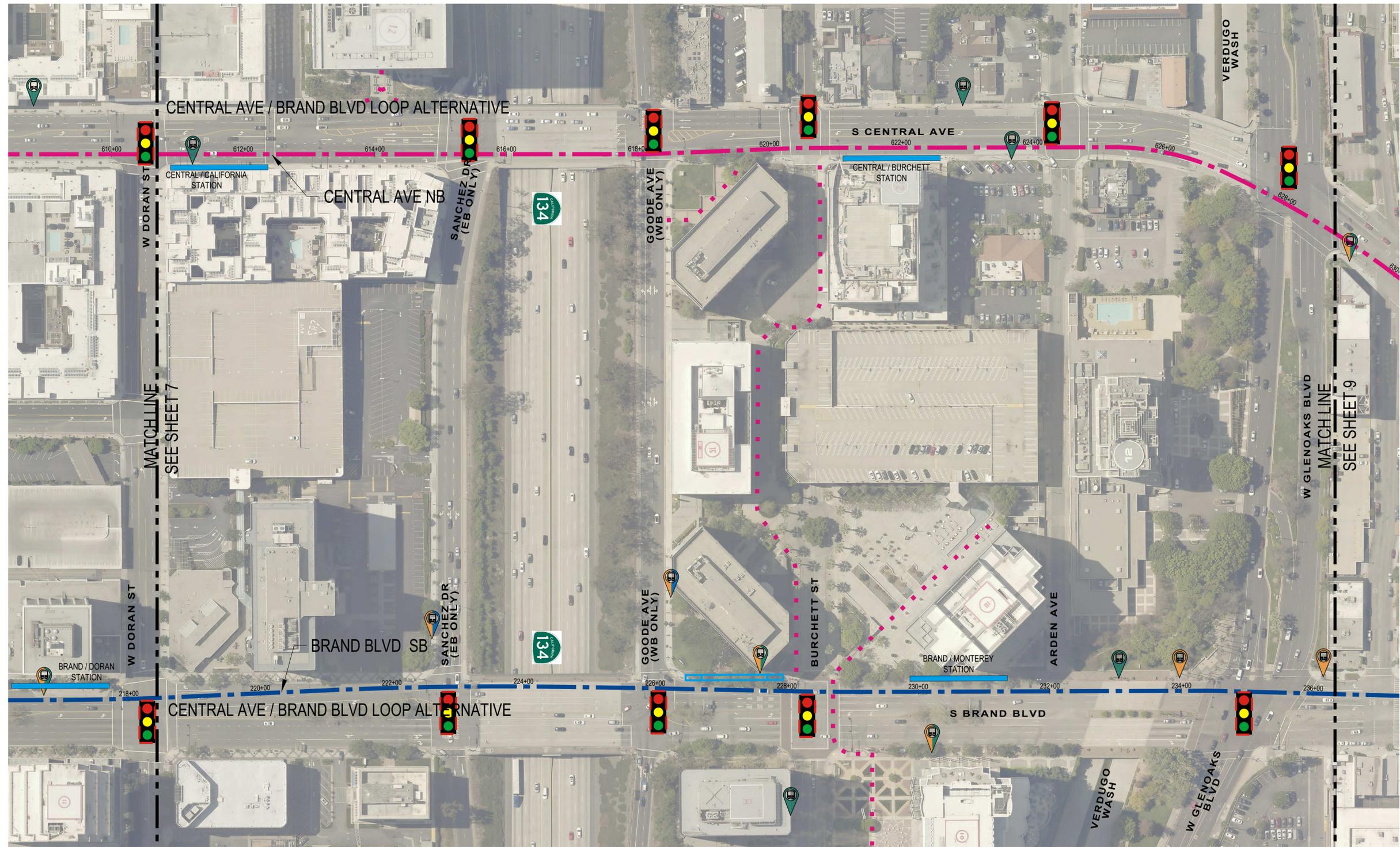
-  MTA STOP
-  BEE LINE STOP
-  MTA/BEE STOP
-  MTA/LADOT STOP



Glendale Streetcar Feasibility Study

Alternative 1 "Central / Brand Loop" between W California Ave to W Doran St
 Sheet 7



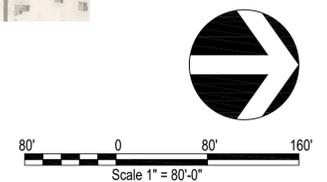


LEGEND

-  PREFERRED STATION LOCATION
-  OPTIONAL STATION LOCATION
-  PUBLICLY ACCESSIBLE WALKWAY

-  MODIFY EXISTING TRAFFIC SIGNAL FOR STREETCAR OPERATIONS

-  MTA STOP
-  BEE LINE STOP
-  MTA/BEE STOP
-  MTA/LADOT STOP



Glendale Streetcar Feasibility Study

Alternative 1 "Central / Brand Loop" between W Doran St to Arden Ave
 Sheet 8



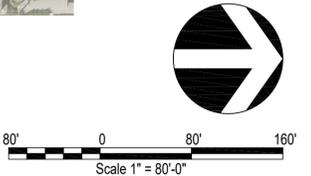


LEGEND

-  PREFERRED STATION LOCATION
-  OPTIONAL STATION LOCATION
-  PUBLICLY ACCESSIBLE WALKWAY

-  MODIFY EXISTING TRAFFIC SIGNAL FOR STREETCAR OPERATIONS

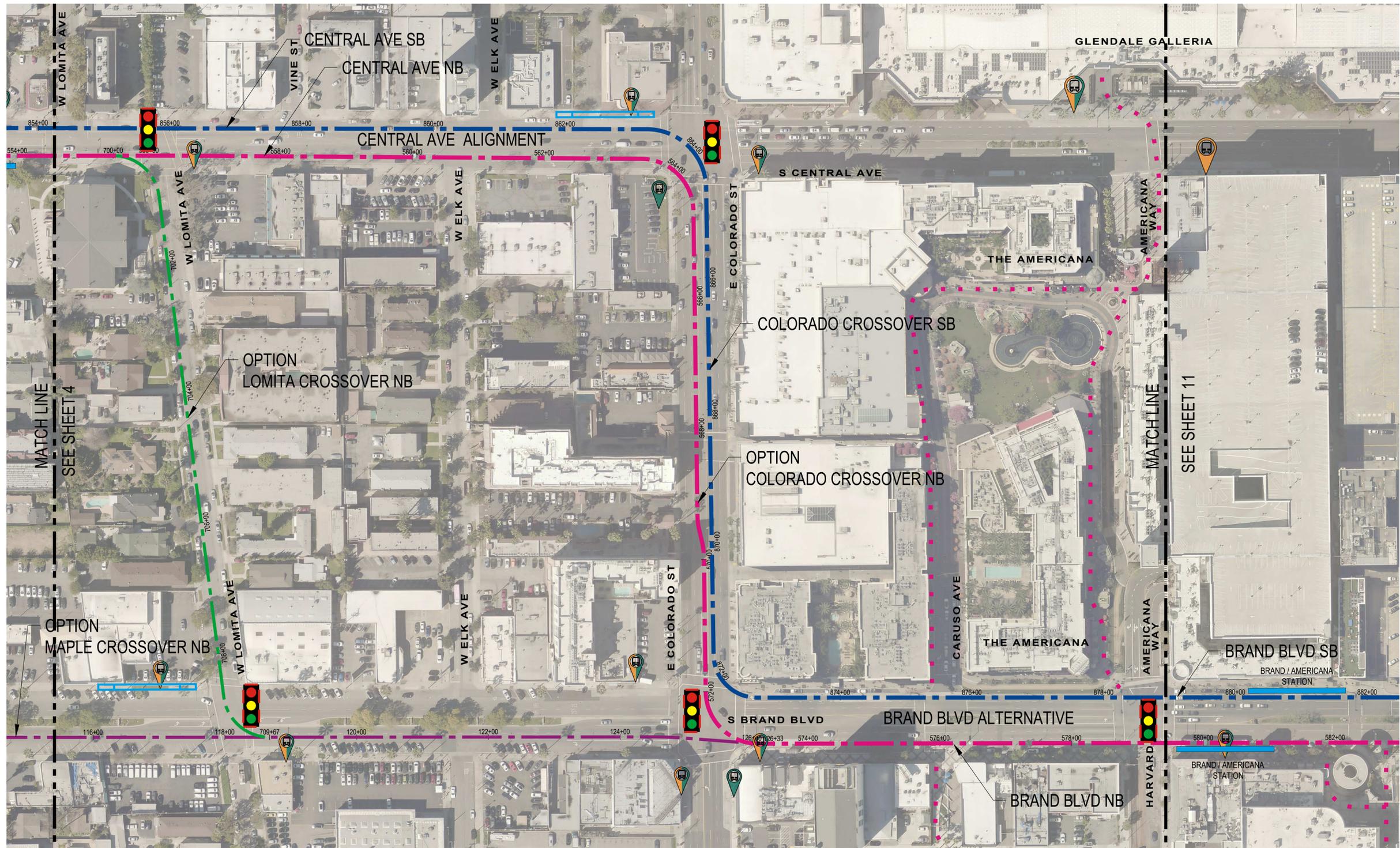
-  MTA STOP
-  BEE LINE STOP
-  MTA/BEE STOP
-  MTA/LADOT STOP



Glendale Streetcar Feasibility Study

Alternative 1 "Central / Brand Loop" between Arden Ave to W Stocker St
 Sheet 9



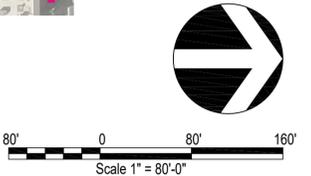


LEGEND

-  PREFERRED STATION LOCATION
-  OPTIONAL STATION LOCATION
-  PUBLICLY ACCESSIBLE WALKWAY

-  MODIFY EXISTING TRAFFIC SIGNAL FOR STREETCAR OPERATIONS

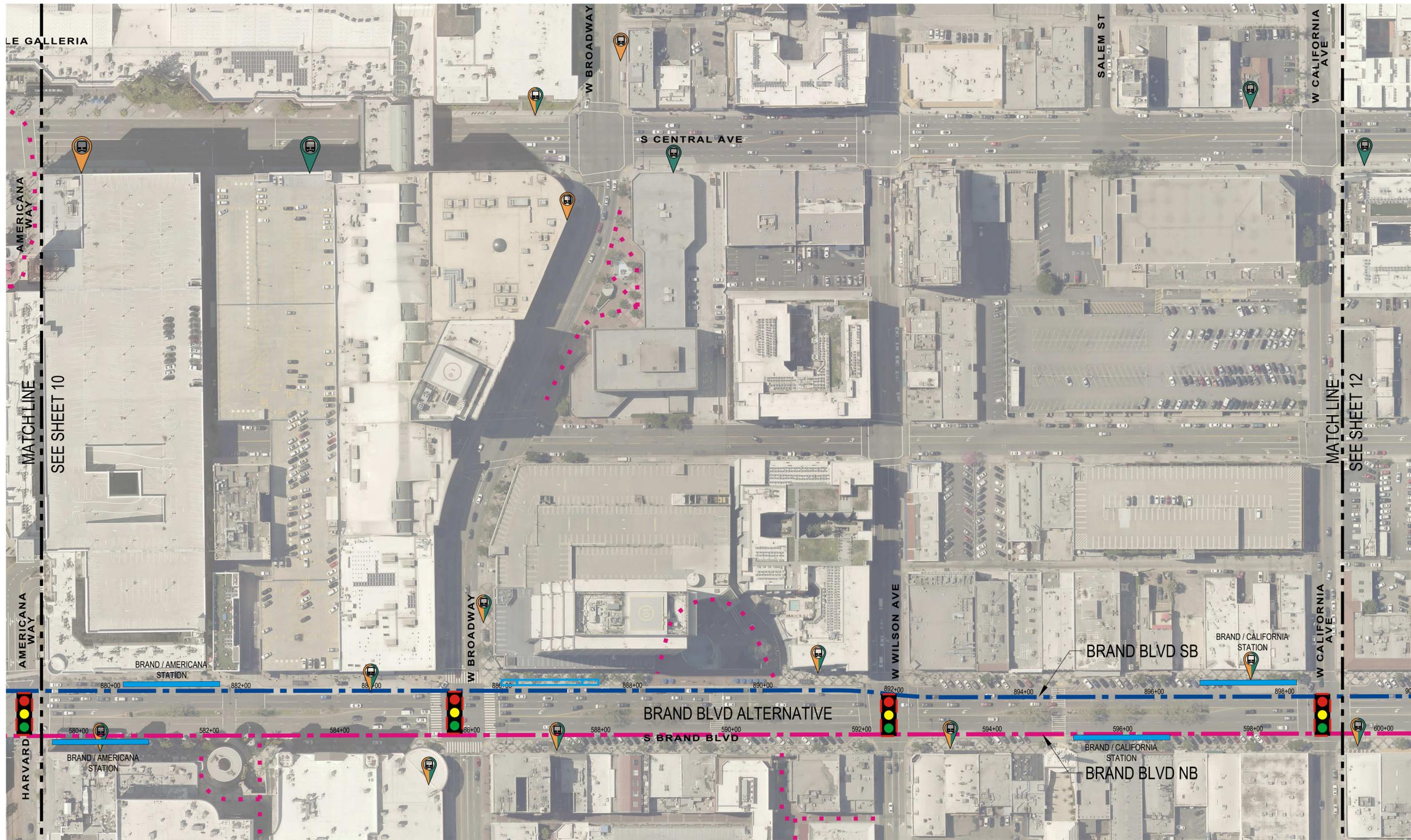
-  MTA STOP
-  BEE LINE STOP
-  MTA/BEE STOP
-  MTA/LADOT STOP



Glendale Streetcar Feasibility Study

Alternative 2 "Two Way on Brand" between W Lomita Ave to Americana Way
 Sheet 10



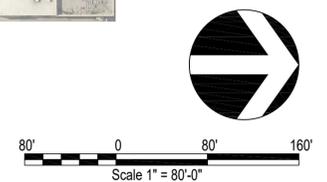


LEGEND

-  PREFERRED STATION LOCATION
-  OPTIONAL STATION LOCATION
-  PUBLICLY ACCESSIBLE WALKWAY

-  MODIFY EXISTING TRAFFIC SIGNAL FOR STREETCAR OPERATIONS

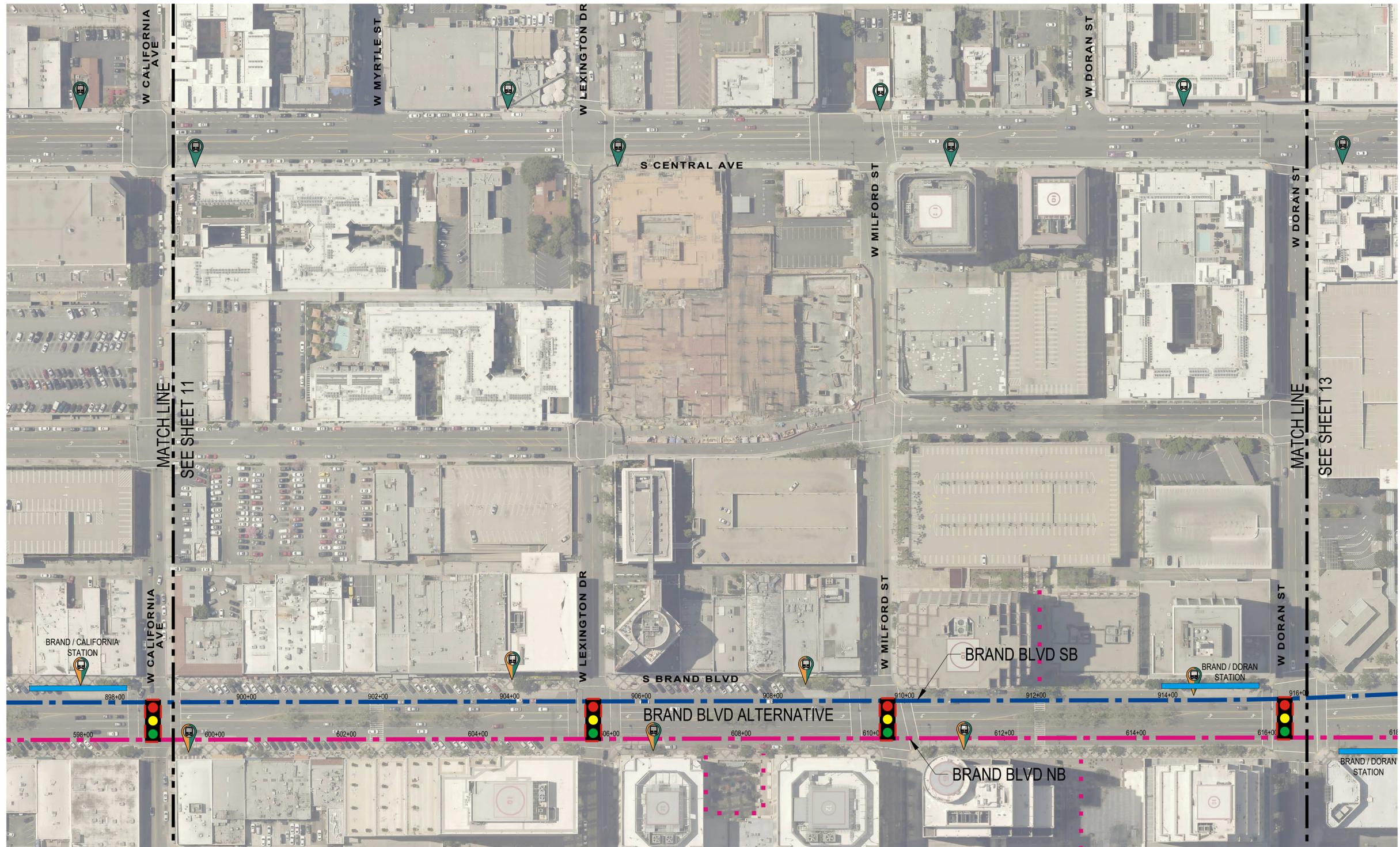
-  MTA STOP
-  BEE LINE STOP
-  MTA/BEE STOP
-  MTA/LADOT STOP



Glendale Streetcar Feasibility Study

Alternative 2 "Two Way on Brand" between Americana Way to W California Ave
 Sheet 11



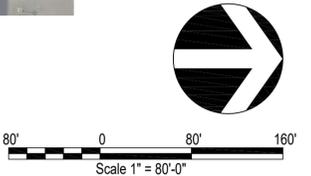


LEGEND

-  PREFERRED STATION LOCATION
-  OPTIONAL STATION LOCATION
-  PUBLICLY ACCESSIBLE WALKWAY

-  MODIFY EXISTING TRAFFIC SIGNAL FOR STREETCAR OPERATIONS

-  MTA STOP
-  BEE LINE STOP
-  MTA/BEE STOP
-  MTA/LADOT STOP



Glendale Streetcar Feasibility Study

Alternative 2 "Two Way on Brand" between W California Ave to W Doran St
 Sheet 12



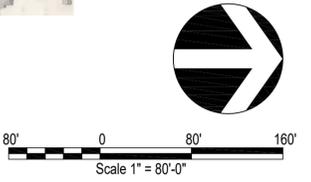


LEGEND

-  PREFERRED STATION LOCATION
-  OPTIONAL STATION LOCATION
-  PUBLICLY ACCESSIBLE WALKWAY

-  MODIFY EXISTING TRAFFIC SIGNAL FOR STREETCAR OPERATIONS

-  MTA STOP
-  BEE LINE STOP
-  MTA/BEE STOP
-  MTA/LADOT STOP



Glendale Streetcar Feasibility Study

Alternative 2 "Two Way on Brand" between W Doran St to Arden Ave
 Sheet 13



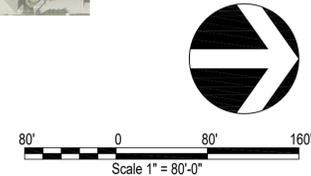


LEGEND

-  PREFERRED STATION LOCATION
-  OPTIONAL STATION LOCATION
-  PUBLICLY ACCESSIBLE WALKWAY

-  MODIFY EXISTING TRAFFIC SIGNAL FOR STREETCAR OPERATIONS

-  MTA STOP
-  BEE LINE STOP
-  MTA/BEE STOP
-  MTA/LADOT STOP



Glendale Streetcar Feasibility Study

Alternative 2 "Two Way on Brand" between Arden Ave to W Stocker St
 Sheet 14



Appendix B

Standard Cost Categories Worksheet

