Regional Connector Transit Corridor
Draft Environmental Impact Statement/
Draft Environmental Impact Report

APPENDIX FF

CONSTRUCTION IMPACTS

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Regional Connector Transit Corridor
Construction Impacts
Technical Memorandum

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State Clearinghouse Number: 2009031043

This technical memorandum was prepared by:

CDM
523 West Sixth Street
Suite 400
Los Angeles, CA 90014

TERRY A. HAYES ASSOCIATES LLC (TAHA)
8522 National Boulevard
Suite 102

Culver City, CA 90232

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ACRONYMS

APE	Area of Potential Effects
ASI	Application Screening Index
BMP	Best Management Practice
BTU	British Thermal Unit
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
Caltrans	State of California Department of Transportation
CARB	California Air Resources Board
CAS	Chemical Abstracts Service
CCAA	California Clean Air Act
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulation
CO	Carbon Monoxide
CWA	Clean Water Act
dBA	A-Weighted Decibels
DPM	Diesel Particulate Matter
DPR	California Department of Parks and Recreation
FTA	Federal Transit Administration
GBV	Ground Borne Vibration

GHG	Greenhouse Gas
HAER	Historic American Engineering Record
HRA	Health Risk Assessment
JANM	Japanese American National Museum
LADOT	City of Los Angeles Department of Transportation
LAMC	Los Angeles Municipal Code
LAPD	Los Angeles Police Department
LRT	Light Rail Transit
LRTP	Long Range Transportation Plan
MOA	Memorandum of Agreement
MOCA	Museum of Contemporary Art
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO_2	Nitrogen Dioxide
NPDES	National Pollutant Discharge Elimination System
O_3	Ozone
OCS	Overhead Catenary System
Pb	Lead
PCB	Polychlorinated Biphenol
PM_{10}	Particulate Matter 10 Microns or Smaller in Diameter
$PM_{2.5}$	Particulate Matter 2.5 Microns or Smaller in Diameter
ppd	Pounds Per Day

PPM	Parts per Million
PPV	Peak Particle Velocity
PSC	Pollutant Screening Level
PSI	Pollutant Screening Index
RMS	Root Mean Square
ROW	Right of Way
RWQCB	Regional Water Quality Control Board
SCAQMD	South Coast Air Quality Management District
SEM	Sequential Excavation Method
SO_2	Sulfur Dioxide
SVP	Society of Vertibrate Paleontology
TAC	Toxic Air Contaminant
TBM	Tunnel Boring Machine
TPSS	Traction Power Substation
TSM	Transportation System Management
USC	United States Code
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
VdB	Vibration Decibels
VOC	Volatile Organic Compound

1.0 SUMMARY

The alternatives under consideration for the Regional Connector Transit Corridor are: the No Build Alternative, the Transportation Systems Management (TSM) Alternative, the At-Grade Emphasis Light Rail Transit (LRT) Alternative, the Underground Emphasis LRT Alternative, the Fully Underground LRT Alternative – Little Tokyo Variation 1, and the Fully Underground LRT Alternative – Little Tokyo Variation 2. This technical memorandum discusses the potential construction-related impacts associated with the TSM Alternative and the build alternatives. Construction of any of the build alternatives is estimated to last approximately four years. Construction impacts would be temporary, short-term.

The No Build Alternative would include the transit investments already planned as described in the Metro *2009 Long-Range Transportation Plan* (LRTP). The No Build Alternative would not result in direct or indirect construction impacts. Furthermore, the No Build Alternative would not have adverse cumulative construction impacts.

The TSM Alternative would include the same transit improvements as the No Build Alternative and would also include two new shuttle bus routes that would serve as a connection between Union Station and the existing 7th Street/Metro Center Station. The TSM Alternative would not involve major infrastructure construction and, therefore, would not result in any direct or indirect adverse construction impacts. Furthermore, the TSM Alternative would not have adverse cumulative impacts during construction.

Construction of the At-Grade Emphasis LRT Alternative is anticipated to result in potentially adverse impacts related to traffic circulation; displacements and relocation; community and neighborhoods; visual and aesthetic resources; air quality; noise and vibration; geotechnical, subsurface, seismic hazards and hazardous materials; water resources; cultural/archeological resources; paleontological resources; parklands and community facilities; and economic and fiscal resources. Measures to minimize harm have been identified for these anticipated potentially adverse construction impacts. Upon implementation of these measures, the potential impacts would not be considered adverse under the National Environmental Policy Act (NEPA) and would be less than significant under the California Environmental Quality Act (CEQA), except for air quality and traffic circulation. The remaining potential impacts on air quality and traffic circulation could not be feasibly mitigated and would be significant and unavoidable. The At-Grade Emphasis LRT Alternative would also contribute to potential impacts on air quality and traffic circulation, resulting in potentially adverse cumulative impacts to air quality and traffic circulation during construction.

Construction of the Underground Emphasis LRT Alternative would result in similar construction-related potential impacts as the At-Grade Emphasis Alternative. Specifically, the Underground Emphasis LRT Alternative would potentially impact traffic circulation; displacements and relocation; community and neighborhoods; visual and aesthetic resources;

air quality; noise and vibration; geotechnical, subsurface, seismic hazards and hazardous materials; water resources; cultural/archeological resources; paleontological resources; parklands and community facilities; and economic and fiscal resources. The level of impact may be more intense than the At-Grade Emphasis LRT Alternative due to the larger volume of soil excavated and the greater potential to encounter archeological, cultural, or paleontological resources. Measures to minimize harm have been identified for these anticipated potentially adverse construction impacts. Upon implementation of these measures, impacts would not be considered adverse under NEPA and would be less than significant under the CEQA, except for air quality and traffic circulation. The remaining potential impacts on air quality and traffic circulation could not be feasibly mitigated and would be significant and unavoidable. The Underground Emphasis LRT Alternative would also contribute to potential impacts on air quality and traffic circulation, resulting in potentially adverse cumulative impacts to air quality and traffic circulation during construction.

Construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1 would result in similar construction-related potential impacts as the Underground Emphasis LRT Alternative. Specifically, the Fully Underground LRT Alternative – Little Tokyo Variation 1 would impact traffic circulation; displacements and relocation; community and neighborhoods; visual and aesthetic resources; geotechnical, subsurface, seismic hazards and hazardous materials; and water resources. The level of impact may be more intense than the Underground Emphasis LRT Alternative due to the larger volume of soil excavated and the potential to encounter archeological, cultural, or paleontological resources. Measures to minimize harm have been identified for these anticipated potentially adverse construction impacts. Upon implementation of these measures, impacts would not be considered adverse under NEPA and would be less than significant under CEQA, except for air quality and traffic circulation. The remaining potential impacts on air quality and traffic circulation could not be feasibly mitigated and would be significant and unavoidable. The Fully Underground LRT Alternative – Little Tokyo Variation 1 would also contribute to potential impacts on air quality and traffic circulation, resulting in potentially adverse cumulative impacts to air quality and traffic circulation during construction.

Construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2 would result in similar construction-related potential impacts as the Underground Alternative – Little Tokyo Variation 1. Specifically, the Fully Underground LRT Alternative – Little Tokyo Variation 2 would impact traffic circulation; displacements and relocation; community and neighborhoods; visual and aesthetic resources; geotechnical, subsurface, seismic hazards and hazardous materials; and water resources. The level of impact may be more intense than the other build alternatives due to the larger volume of soil excavated and the potential to encounter archeological, cultural, or paleontological resources. Measures to minimize harm have been identified for these anticipated potentially adverse construction impacts. Upon implementation of these measures, the potential impacts would not be considered adverse

under NEPA and would be less than significant under CEQA, except for air quality and traffic circulation. The remaining potential impacts on air quality and traffic circulation could not be feasibly mitigated and would be significant and unavoidable. The Fully Underground LRT Alternative – Little Tokyo Variation 2 would also contribute to potential impacts on air quality and traffic circulation, resulting in potentially adverse cumulative impacts to air quality and traffic circulation during construction.

2.0 INTRODUCTION

This Technical Memorandum describes the expected potential construction scenario for the TSM Alternative and the build alternatives. The discussion includes typical construction methods that would be used when building the Regional Connector. The construction period for the build alternatives is estimated to last approximately four years. The conditions and potential impacts described in this section would only occur during construction, and would be temporary and short-term. Some permanent impacts would begin during construction, such as the elimination of parking, and these are evaluated in other technical reports as operational impacts. The analysis in this Technical Memorandum focuses primarily on potential temporary impacts that would occur as a result of the construction process.

3.0 METHODOLOGY FOR IMPACT EVALUATION

3.1 Federal Regulatory Framework

The United States Environmental Protection Agency (USEPA) creates regulation that governs the assessment and consideration of construction impacts on the environment for various topic areas, including air quality, water quality, hazardous materials, biological resources, and cultural preservation under NEPA (42 United States Code [or USC] Section 4231). NEPA places regulatory responsibility on the federal government to "use all practicable means" to "assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings." The following federal regulations apply to the evaluation of construction effects for the proposed project.

3.1.1 Air Quality

The Federal Clean Air Act (CAA) of 1963 regulates air quality in the United States. The USEPA is responsible for enforcing the CAA and establishing the National Ambient Air Quality Standards (NAAQS). NAAQS have been established for seven major air pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter 2.5 microns or smaller in diameter ($PM_{2.5}$), particulate matter ten microns or smaller in diameter (PM_{10}), sulfur dioxide (SO_2), and lead (Pb).

3.1.2 Water Quality

The National Pollutant Discharge Elimination System (NPDES) regulates the issuance of storm water permits necessary for projects that will require dewatering or discharge pollutants from any point source into waters of the United States. The Clean Water Act (CWA) of 1972 provides the statutory basis for the NPDES permit program. A plan must be submitted to obtain a NPDES permit, which lists potential sources of pollutants during construction, and identifies erosion prevention, sediment control, dewatering procedures and storm water management measures to be implemented during construction of the proposed project.

3.1.3 Hazardous Materials

The Resource Conservation and Recovery Act of 1976 under Title 40, Protection of the Environment of the Code of Federal Regulations (CFR), regulates hazardous wastes that may be encountered during construction activities. The Toxics Substances Control Act of 1976 regulates handling of polychlorinated biphenol (PCB) wastes encountered during construction or demolition. In addition, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 regulates the handling and removal of underground storage tanks that may be encountered during construction.

3.2 State Regulatory Framework

3.2.1 Air Quality

In addition to being subject to the requirements of CAA, air quality in California is also governed by more stringent regulations under the California Clean Air Act (CCAA). The CCAA, which is governed by the California Air Resources Board (CARB), requires all air districts in the State to endeavor to achieve and maintain the California Ambient Air Quality Standards (CAAQS) established for construction activities.

3.2.2 Water Quality

The State Regional Water Quality Control Board (RWQCB) is responsible for administering water quality at the State level. Water quality during construction activity would be related to activities which encounter groundwater or affect the groundwater quality.

3.3 Local Regulatory Framework

3.3.1 Air Quality

The South Coast Air Quality Management District (SCAQMD) is the agency principally responsible for comprehensive air pollution control in the region. SCAQMD has jurisdiction over an area of approximately 10,740 square miles, consisting of Orange County, the non-desert portions of Los Angeles, Riverside, and San Bernardino Counties, and the Riverside County portion of the Salton Sea Air Basin and Mojave Desert Air Basin. SCAQMD has developed regional and localized significance thresholds for air pollutants during construction.

3.3.2 Noise

The Los Angeles Municipal Code (LAMC) Section 112.05 provides noise ordinances that specify construction hours and construction equipment noise thresholds. The noise thresholds and applicable hours of construction are as follows:

- Construction activities lasting more than one day would exceed existing exterior noise levels by ten A-weighted decibels (dBA) or more at a sensitive use.
- Construction activities lasting more than ten days in a three-month period would exceed existing ambient exterior noise levels by five dBA or more at a noise sensitive use.
- Construction activities would exceed the ambient noise level by five dBA at a sensitive use between the hours of 9:00 p.m. and 7:00 a.m. Monday through Friday, before 8:00 a.m. or after 6:00 p.m. on Saturday, or at any time on Sunday.

3.4 CEQA Guidelines

The CEQA Guidelines implicitly acknowledge that construction-related changes may be the source of significant impacts to the physical environment even though these effects may be short-term in duration. Typically, significant construction effects are identified in CEQA as changes to the physical environment that are particularly disruptive or that have specific health and safety considerations. There are no specific thresholds of significance for impacts from construction-related activities under CEQA for the following environmental topics:

- Land Use and Development
- Displacements and Relocation
- Ecosystems/Biological Resources
- Energy
- Climate Change
- Cultural/Archeological/Paleontological Resources
- Economic and Fiscal
- Growth-Inducing Impacts
- Environmental Justice

However, the potential for impacts that could occur during the construction period (although not explicitly as a result of construction activities) is presented in the respective technical memoranda for the environmental topics above.

3.4.1 Traffic Circulation and Parking

A significant transportation impact would occur if construction-related activities result in temporary short and long-term lane closures, turning prohibitions, reduced access to the circulation network, removal of parking, or secondary impacts to adjacent streets (see the Transportation Technical Memorandum for more information).

3.4.2 Community and Neighborhood Impacts

A significant community or neighborhood impact would occur if construction-related activities physically divide an established community or neighborhood.

3.4.3 Visual Resources and Aesthetics

A significant visual resource or aesthetic impact would occur if construction-related activities substantially degrade the existing visual character or quality of a significant site or its surroundings, or create a new source of substantial light or glare which would adversely affect day or nighttime views.

3.4.4 Air Quality

A significant air quality impact would occur if construction-related activities:

- Exceed SCAQMD daily regional and localized construction emissions thresholds emissions for VOC, NOX, CO, SOX, PM2.5, or PM10;
- Generate significant emissions of TACs;
- Create an odor nuisance; and/or
- Cause CO concentrations at study intersections by construction-related traffic to violate the CAAQS for either the one- or eight-hour period. The CAAQS for the one- and eight-hour periods are 20 parts per million (ppm) and 9.0 ppm, respectively. If CO concentrations currently exceed the CAAQS, then an incremental increase of 1.0 ppm over "no build" conditions for the one-hour period would be considered a significant impact. An incremental increase of 0.45 ppm over the existing conditions for the eight-hour period would be considered significant.

3.4.5 Noise and Vibration

A significant noise impact would occur if construction-related activities exceed the ambient noise level by five dBA at a noise sensitive use between the hours of 9:00 p.m. and 7:00 a.m. Monday through Friday, before 8:00 a.m. or after 6:00 p.m. on Saturday, or anytime on Sunday unless mitigated to the greatest extent feasible.

A significant vibration impact would occur if construction-related activities cause vibration damage to surrounding buildings. The potential for ground borne vibration (GBV) to cause damage to buildings varies based on the types of buildings (i.e., building materials and structural techniques) involved. The Federal Transit Administration (FTA) vibration damage criteria for various structural categories are listed below in Table 3-1.

Table 3-1. FTA Construction Vibration Damage Criteria	
Building Category and Description	**Peak Particle Velocity (PPV) (in/sec)**
I. Reinforced-concrete, steel, or timber (no plaster)	0.5
II. Engineered concrete and masonry (no plaster)	0.3
III. Non-engineered timber and masonry buildings	0.2
IV. Buildings extremely susceptible to vibration damage	0.12

Source: U.S. Federal Transit Administration's "Transit Noise and Vibration Impact Assessment Manual", May 2006. FTA-VA-90-1003-06. Table 12-3.

3.4.6 Geotechnical/Subsurface/Seismic/Hazardous Materials

3.4.6.1 Geotechnical/Subsurface/Seismic

A significant geotechnical/subsurface/seismic impact would occur if construction-related activities result in substantial damage to structures or infrastructure, expose people to substantial risk of injury; cause or accelerate instability from erosion; or accelerate wind, water erosion, and sedimentation resulting in sediment runoff or deposition which would not be contained or controlled on-site.

3.4.6.2 Hazardous Materials

A significant hazardous materials impact would occur if construction-related activities create a significant hazard to the public or environment through the routine transport, storage, use, or disposal of hazardous materials; create reasonably foreseeable accident conditions; emit hazardous emissions within one-quarter mile of an existing or proposed school; or physically interfere with an adopted emergency response plan.

3.4.7 Water Resources

A significant water resource impact would occur if construction-related activities change the direction of existing groundwater contaminants; substantially deplete groundwater supplies or recharge resulting in a lowering of the local groundwater table; alter the existing drainage pattern of the site or area, including the course of a stream or river, resulting in substantial erosion or siltation on- or off-site; create runoff water that exceeds the capacity of existing or

planned storm water drainage systems; provide substantial additional sources of polluted runoff; or otherwise substantially degrade water quality.

3.4.8 Parklands and Other Community Facilities

A significant parkland or community facility impact would occur if construction-related activities impair implementation of or physically interfere with an adopted emergency response plan.

3.4.9 Safety and Security

A significant safety or security impact would occur if construction-related activities increase pedestrian and/or bicycle safety risks or substantially limit the delivery of community safety services, such as police, fire, or emergency services, to locations along the proposed alignment.

3.5 Methodology

The analysis in this report is based on the activities outlined in the Draft Description of Construction Methods. Key considerations include potential construction methods, sequencing, phasing, staging areas, and possible effects on environmental resources. Each environmental topic area is analyzed to identify three classes of potential impacts:

- Direct Impacts – Impacts that would occur as a result of the construction process
- Indirect Impacts – Impacts that would be reasonably foreseeable future actions related to the construction process.
- Cumulative Impacts - Impacts that would result from the combined effects of the Regional Connector and other projects in the vicinity.

Multiple contractors would work on the project during the construction period. A representative phasing of construction is shown in Table 3-2. Many of the project elements could be constructed simultaneously, and the overall duration of construction would be approximately four years.

Table 3-2. Typical Phasing of Construction Activities		
Activity	**Tasks**	**Average Time Required (months)/a/**
Site Survey	Locate utilities, establish ROW and project control points and centerlines, and relocate survey monuments	4 to 6
Site Preparation	Relocate utilities and clear and grub ROW (demolition), widen streets, establish detours and haul routes, erect safety devices and mobilize special construction equipment, prepare construction equipment yards and stockpile materials	12 to 18
Heavy Construction	Construction of tunnels, street guideways including trackbed, subway stations and portals, trenches, piles, and disposal of excess material. Refinish roadways and sidewalks.	24 to 48
Medium Construction	Lay track, construct surface stations, drainage, backfill and pave streets.	12 to 24
Light Construction	Finish work, install all systems elements (electrical, signals, and communication), street lighting where applicable, landscaping, signing and striping, close detours, clean-up and test system.	4 to 6
Pre-Revenue Service	Testing of communications, signaling, and ventilation systems, training of operators and maintenance personnel	3 to 6

/a/ Some of these activities would be completed simultaneously.
Source: TAHA, 2010.

4.0 AFFECTED ENVIRONMENT

This section examines the affected environment as it relates to construction activities for the proposed TSM Alternative and the build alternatives.

4.1 Area of Potential Impact

The project is located in the downtown area of the City of Los Angeles. The project area includes several communities, including the Financial District, Bunker Hill, Civic Center, Little Tokyo, Toy District, Historic Core, and Arts District. These areas are fully urbanized, and limited space is available for construction staging. Multiple community and environmental resources would potentially be impacted by construction of the TSM Alternative or the build alternatives.

4.2 General Construction Scenario

The construction activities for the TSM Alternative include installation of new bus stops and associated structures. These activities would require minimal construction equipment and would occur in the existing street and sidewalk right-of-way. The surrounding transportation infrastructure would be maintained. Construction activities would last approximately four months.

The construction duration for the build alternatives would be approximately four years. However, construction activities at any one location may be shorter. In the vicinity of cut and cover construction, surface streets would be impacted intermittently over a period of 24 to 48 months. Construction could begin simultaneously at several locations along the selected route to minimize the overall construction times. Facilities requiring the lengthiest construction work, such as tunnels, underground stations, and grade separation segments, could potentially be started first so that the entire alignment is completed at approximately the same time.

Construction of the proposed alternatives would involve conventional techniques and equipment typically used on similar projects in the Southern California region. Methods would include cut and cover excavation for certain segments of tunnels, crossovers, portals, stations and ancillary facilities and Tunnel Boring Machine (TBM) excavation for portions of the Underground Emphasis LRT Alternative and the Fully Underground LRT Alternatives beneath 2nd Street. The 2nd/Hope Street station would be constructed using either the open cut or the Sequential Excavation Method (SEM), and off-street portions of the underground alignments would be constructed using the open cut method. Also, the proposed portal on 1st Street for the Fully Underground LRT Alternative would be constructed using either the open cut or cut and cover method.

The equipment that would be used during construction may include rail-mounted vehicles, earth moving vehicles, cranes, concrete mixers, flatbed trucks, sand and gravel delivery trucks, dump trucks, and TBMs. These construction vehicles may temporarily impede traffic mobility in areas of construction and, therefore, traffic detours, designated truck routes, and off-peak hauling schedules could be required during construction. Traffic management and traffic control measures would be coordinated with the City of Los Angeles Department of Transportation (LADOT).

Construction would follow all applicable local, state, and federal laws for building and safety. The Metro Fire Life Safety Committee, composed of members from the City and County of Los Angeles Fire Departments and Metro specialists, would approve all construction methods. Working hours would be varied to meet special circumstances. Standard construction methods would be used for traffic, noise, vibration, and dust control, consistent with all applicable laws as described in the following sections.

To provide an understanding of the likely steps involved, the anticipated construction activities are described below. This potential construction sequence does not represent the order in which construction activities would be performed. Actual construction would be a complex process with many activities taking place simultaneously. Some of the construction methods and sequences would be left to the discretion of the construction contractor.

4.2.1 Utility Relocation and Street Closures

Prior to beginning construction it would be necessary to relocate, modify, or protect in place all utilities and below-grade structures which would conflict with excavations for street level track work and excavation (cut and cover sections, tunneling, and station structures). Shallow utilities that would interfere with guideway excavation work, such as maintenance holes or pull boxes, would require relocation. These utilities would be modified and moved away from the construction area.

Travel lanes would need to be temporarily occupied during utility relocation for approximately two to three blocks at a time. Closures could potentially occur in stages and alternate between opposite sides of the street. Depending on the extent of utility relocation work, construction could last up to four months on each two-block segment. Some of the major utilities (greater than 18 to 24 inches in diameter), such as the storm drains on 2nd and on Flower Streets, may require more complex construction sequences and schedules for relocations and supports. Other preconstruction activities, such as soldier piling or installation of geotechnical instrumentation, may require temporary partial street closures and the use of drilling equipment and excavators.

4.2.2 Staging Areas and Haul Routes

Temporary easements would be required at various locations for construction staging. Easements typically include portions of the sidewalk and street, and sometimes private property. The street alongside the stations and track areas, supplemented by adjacent off-street areas, would be used for construction staging and for equipment and material storage. Construction staging within the street right-of-way is also envisioned where no off-street areas can be identified.

Site clearance and demolition of existing structures at the construction staging areas would also be necessary before major construction begins. Figure 4-1 shows the location of potential staging areas along the build alternatives alignment, including the approximate footprints of the construction staging areas.

To facilitate the removal of excavated materials, haul routes to disposal sites would be predetermined by agreement with local authorities prior to construction. Routes would follow streets and highways that form the safest, shortest route with the fewest adverse effects on traffic, residences, and businesses.

4.2.3 At-Grade Construction Methods

4.2.3.1 Surface Track work

Track work construction involves demolition of the affected roadway sections, preparation of the track bed, construction of the supporting track slab, and laying of rail. Foundations for overhead catenary poles may be installed simultaneously. Construction would be performed within the parking and travel lanes identified to be permanently removed as part of the project and potentially in parallel lanes which would be impacted temporarily. Typical drilling of the shafts for catenary pole and track installation is relatively shallow. Given the urban context of the project area, approximately two-block segments of the roadway at a time are likely to be reserved for construction activities in order to achieve economies of scale and minimize the schedule. Rails would be brought to the site by truck, stockpiled at designated storage areas, welded into rail strings, and moved into place as work progresses. Construction durations for each two-block segment are estimated to be two to four months. Periodic lane closures, typically on just one side of the work zone, would be required for delivery of materials and other construction activities such as concrete pours. Construction of station platform slabs would likely be included in line segment contracts and would be coordinated with track work installation.

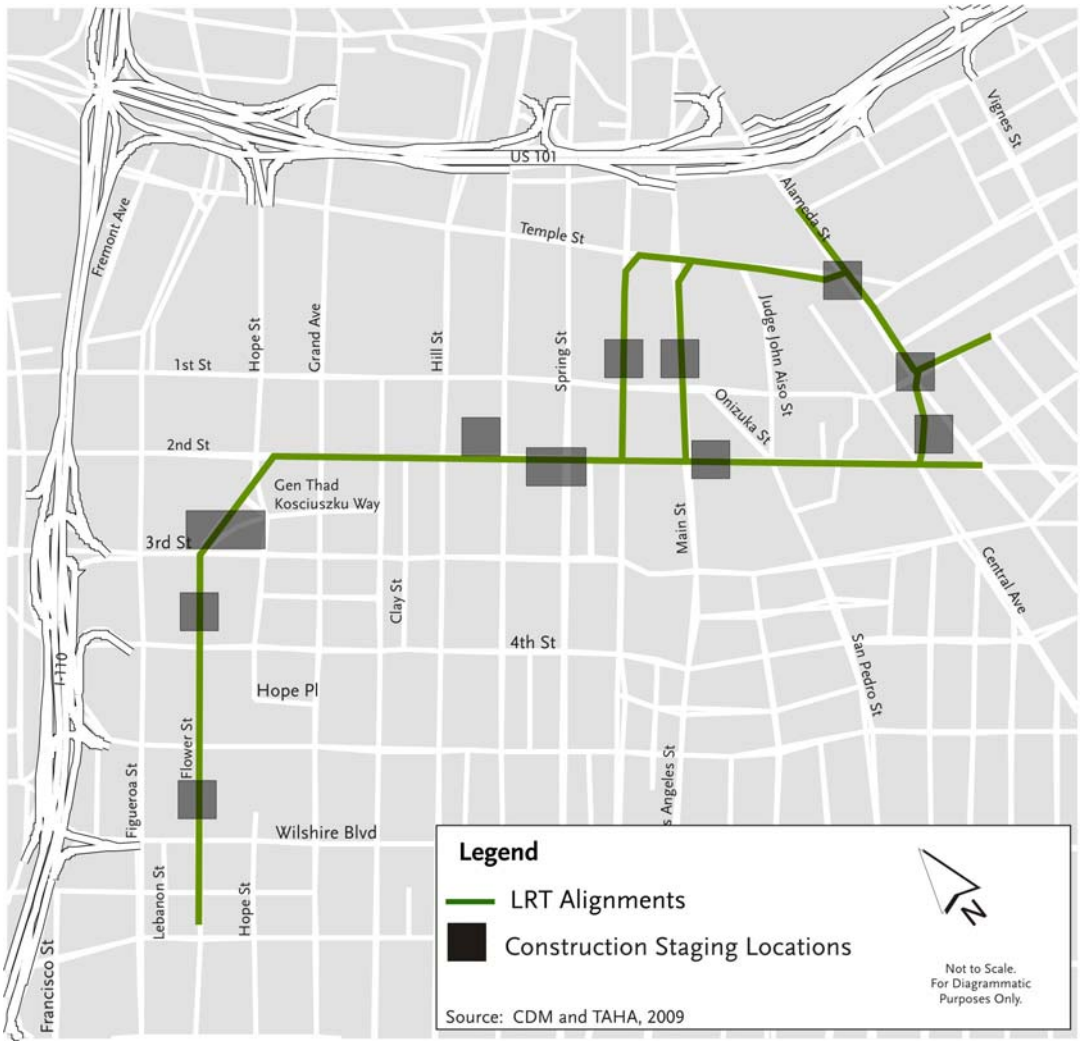


Figure 4-1. Construction Staging Area Locations

During construction within a two-block segment, cross streets and alleyways may be temporarily closed. Major cross streets would require partial closure, usually half of the street at a time, for the construction of surface stations and the light rail trackbed. Depending on allowable working hours, full blocks may require closure during excavation, preparation of subgrade, drilling for soldier pile installation, and track foundation placement. Closures would be staggered to facilitate traffic control. Where streets are not fully closed, two-way traffic could be allowed on half of the street. After the trackbed is constructed across a local street and the roadway is restored to its permanent condition, vehicles can resume planned traffic patterns (e.g. 2nd Street would have single direction traffic for the At-Grade Emphasis LRT Alternative). Rails would be brought to the sites by truck, and local rail storage areas

would be necessary for short-term storage and to facilitate placement of the rails. Equipment used for construction of surface tracks and stations would be similar to the equipment required for relocation of utilities, plus track-laying equipment, paving machines, concrete mixers, and concrete finishers. The areas of the proposed alternatives where at-grade construction is anticipated are shown in Figure 4-2.

4.2.3.2 At-Grade Stations

The at-grade station platforms on Main Street and Los Angeles Street could be constructed at the same time as other segments of the alternative, although the construction contractor may elect to construct them sequentially. Materials would be delivered to staging areas and station sites via the shortest, safest route agreed upon by local authorities. The at-grade station platforms would be constructed using standard building materials that are durable and resistant to vandalism, such as concrete, steel, aluminum, and heavy plastic. The station would consist of two single-direction platforms located along the eastern curb of Main and Los Angeles Streets.

4.2.4 Underground Construction Methods

4.2.4.1 Cut and Cover Construction

Cut and cover construction is one of various traditional construction methods for underground facilities. It entails a construction shoring system, excavating down from the ground surface, placing a temporary deck over the excavated area, constructing the underground facilities beneath the deck, and then backfilling and restoring the surface once the facilities are completed (Figure 4-3). Temporary excavation support would be provided to stabilize the ground, allowing excavation to be carried out inside the supported area. Temporary concrete decking can be placed over the cut immediately following the first part of excavation (at about 12 to 15 feet below ground surface) to allow traffic to pass above. Once the deck is in place, excavation and internal bracing would continue to the required depth. Once the desired construction is completed inside the excavated area, the deck would be removed, the excavation would be backfilled, and the surface would be restored permanently.

For the build alternatives, cut and cover construction would be utilized in various portions of the proposed alignments (Figure 4-2). These areas include underground cut-and-cover and trackway construction on Flower Street between 7th Street and 3rd Street, underground stations, crossovers, portals, and entry areas for a TBM.

Cut and cover construction would begin with the identification and relocation of utilities in the project area. Once the utilities are relocated, construction of temporary retaining walls would be required to support the soils laterally for excavation of the cut and cover tunnel, the underground station, or potential underpass to the required depths. Depending on the depth of excavation, ground conditions, proximity of adjacent structures to the proposed construction, building foundation type, and the potential for construction-induced ground

movement, an appropriate temporary support method would be selected. Temporary excavation support systems include:

- Tangent Pile Walls - reinforced concrete drilled-in-place piles which are contiguous; equipment required for installation includes drill rigs, concrete trucks, cranes, and dump trucks; or
- Secant Pile Walls - similar to tangent pile walls, but they overlap each other, providing better water tightness and ground support ; or
- Soldier Piles and Lagging, or Slurry Walls - typically constructed along the perimeter of excavation areas and involve installing soldier beams (vertical steel beams) at regular intervals and placing precast panels or other lagging materials between the beams to form the retaining wall.



Figure 4-2A Construction Methods (At-Grade Emphasis LRT Alternative)

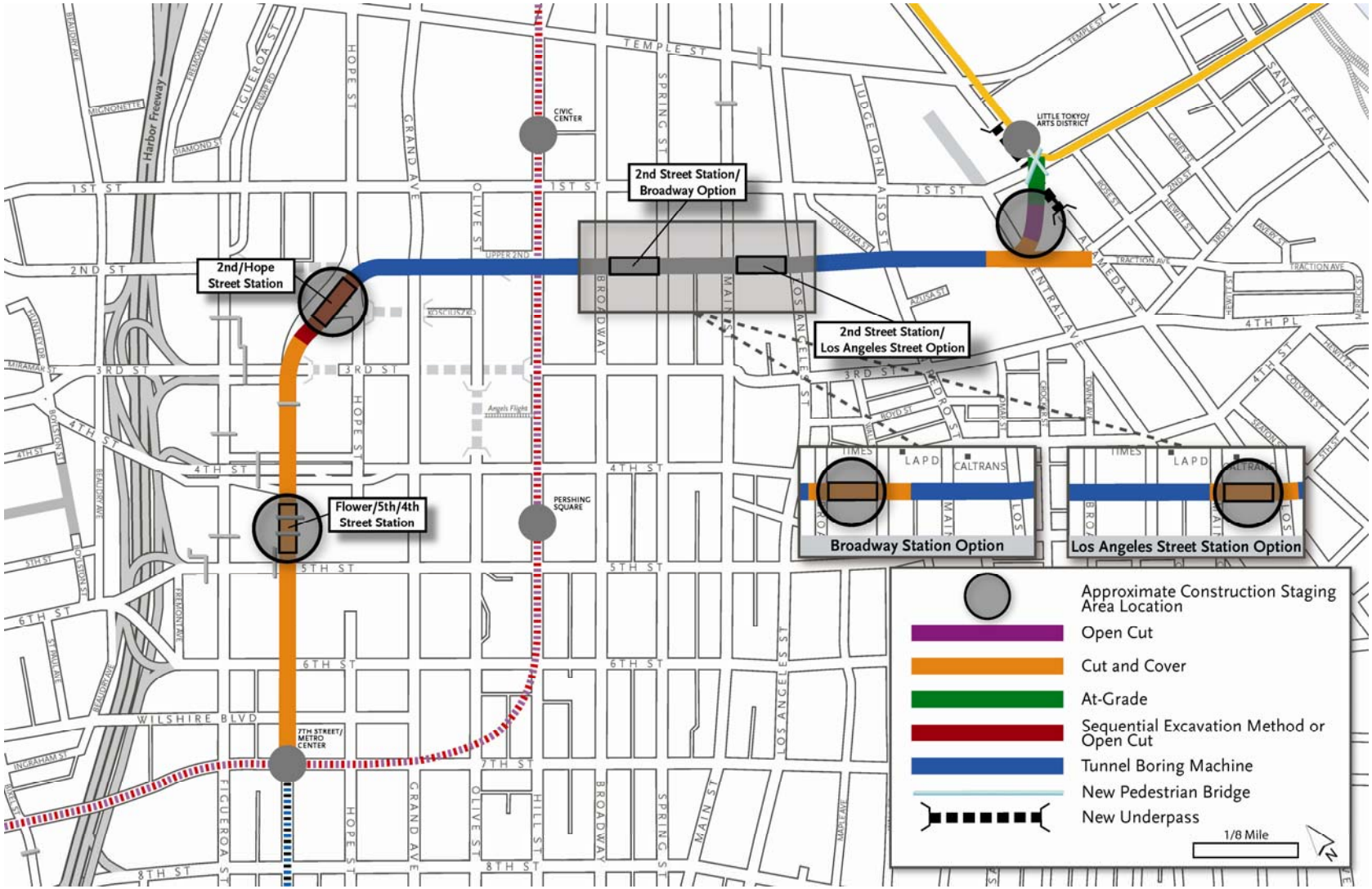


Figure 4-2B Construction Methods (Underground Emphasis LRT Alternative)

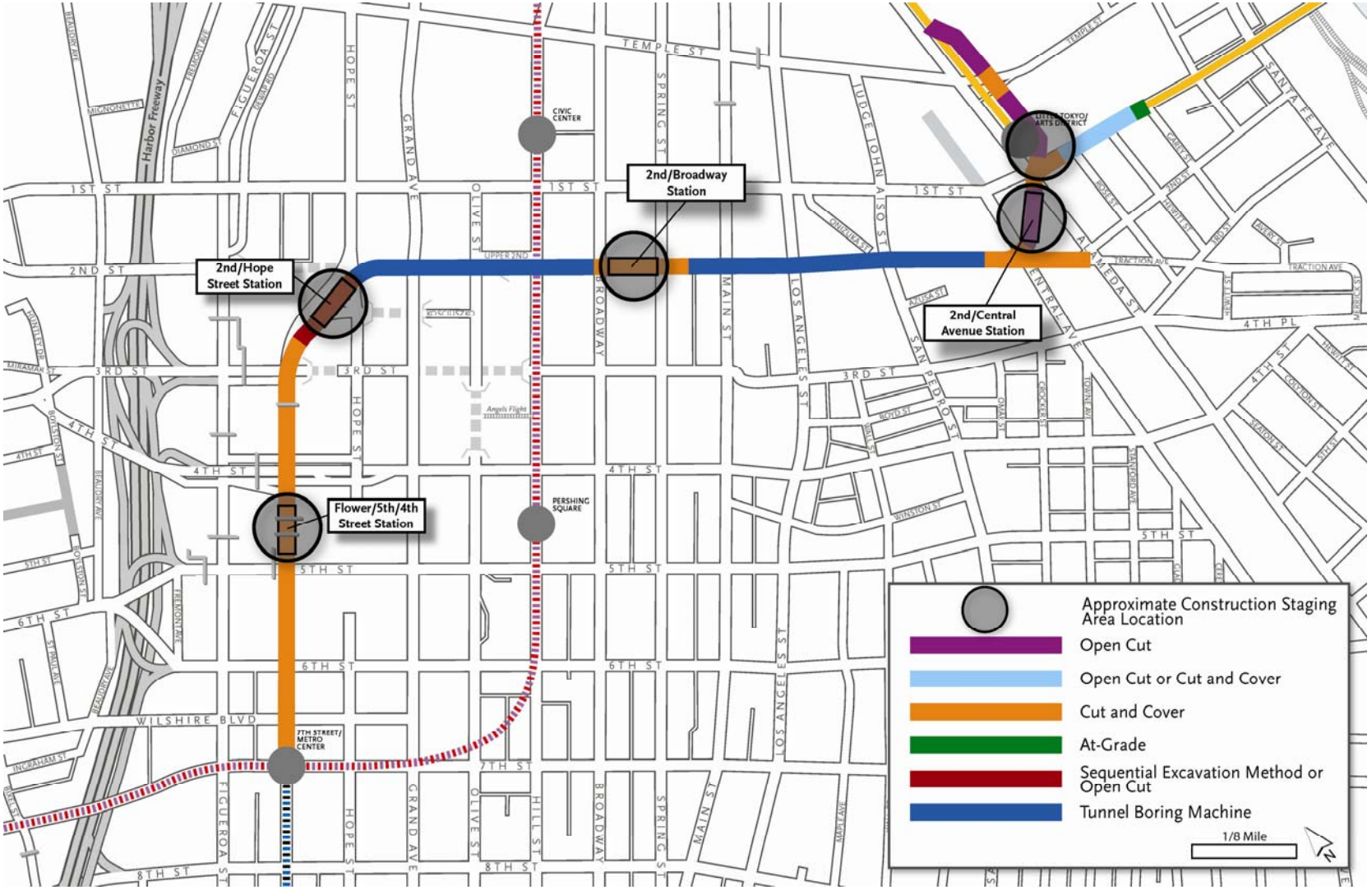


Figure 4-2C Construction Methods (Fully Underground LRT Alternative)

These wall systems would be braced with internal struts or supported by tiebacks as the excavation progresses. Tiebacks consist of horizontal or inclined wire strands or steel rods installed in drilled holes in the ground behind the wall. One end of each tieback would be secured to the wall, and the other end would be anchored to stable ground to provide sufficient resistance and to limit ground movement. Prior to the installation of a temporary ground support system, dewatering may be required at underground station locations and tunnel sites in alluvium to temporarily lower the groundwater level below the excavation depth or to an impermeable layer. Dewatering facilitates installation of soldier piles and other non-watertight shoring systems, improves soil stability, and allows excavation in dry conditions. Groundwater would be pumped from wells installed around the perimeter of the excavation.

After installation of the temporary shoring support system and initial excavation, the contractor would proceed with installation of the deck beams, followed by multiple sequences of excavation and installation of cross bracing or tieback systems. Pre-cast concrete decking panels would allow traffic and pedestrian circulation to resume after the initial excavation, since they would be installed flush with existing street or sidewalk levels. Deck installation would require temporary lane closures in the cut-and-cover areas. Concrete decking would be installed in progressive stages and would require much less time than the overall station or crossover construction, which would occur underneath the street after decking is installed. Based on experience with the cut and cover construction of the two underground stations on the Metro Gold Line to East Los Angeles, after the shoring system was in place, decking installation occurred over several weekends only with non-stop activity from Friday at 5 pm to Monday morning at 6 am with community and local agency approval. Similar progressive staging could be performed for the Regional Connector. Portal construction would employ construction methods similar to those used for station excavations and retaining walls, but the portal could remain permanently open and no decking would be required during construction. However, decking may be used during construction of the portal facilities on 1st and 2nd Streets for the Fully Underground LRT Alternatives.

Cut and cover construction plans would need to address the potential presence of temporary shoring and tieback systems that were utilized during construction of the underground basements of many structures in downtown Los Angeles. Many of these temporary shoring and tieback systems were abandoned in place once building construction was completed, as is common practice in the City of Los Angeles and elsewhere in Southern California. These abandoned tiebacks could be encountered under Flower Street and 2nd Street. Steel tieback cables could also impede TBM operation.

The trackway planned under Flower Street between 7th and 3rd Street, and all underground stations and crossovers would be built with the cut and cover technique. A potential exception is the 2nd/Hope Street station where SEM construction is being considered for the Underground Emphasis LRT Alternative and Fully Underground LRT Alternatives due to the

station's depth. Open cut construction would be used for the 2nd Street/Central Avenue station for both of the Fully Underground LRT Alternatives. The activities described for

underground station construction could last up to 48 months at each underground station location. Based on the anticipated volume of excavation for the cut and cover tunnel and stations, it is estimated that an average of 20 to 30 dump truck trips per day would be required to haul and dispose of the excavated soils.

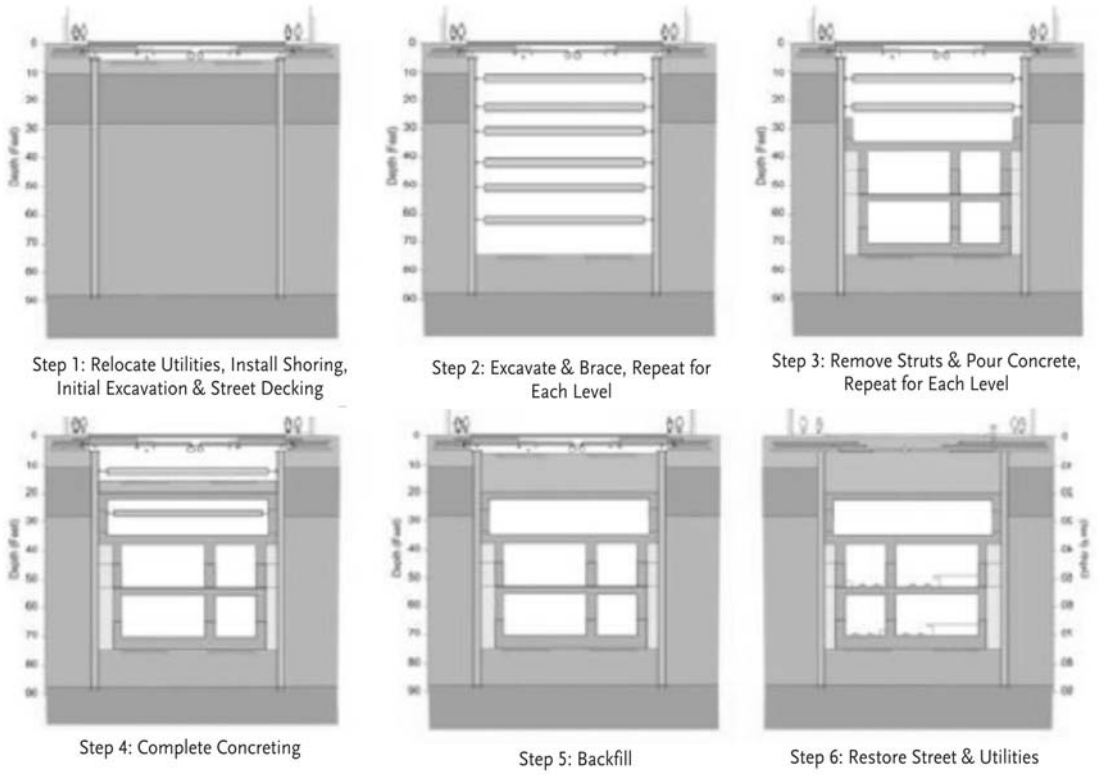


Figure 4-3. Cut and Cover Construction Method

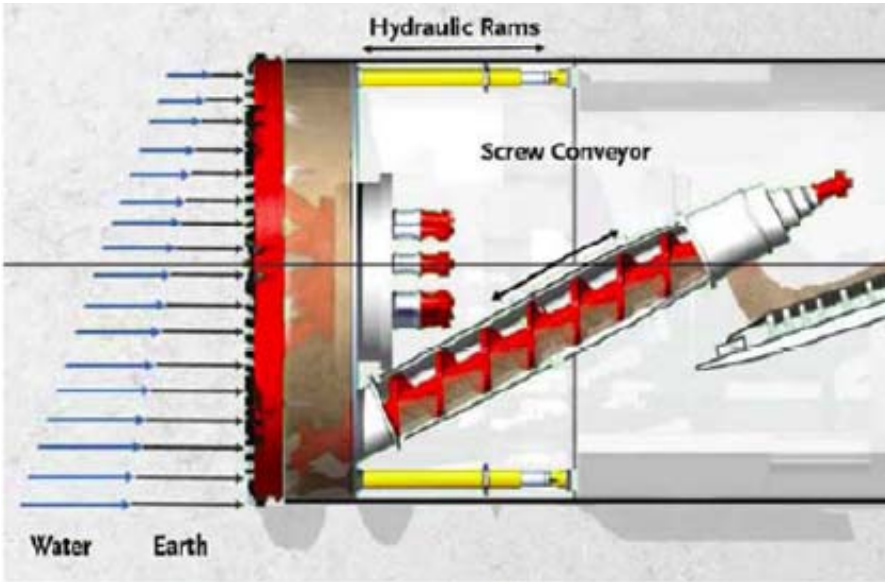
The Open Cut construction method is similar to Cut and Cover, but does not include temporary decking.

4.2.4.2 Tunnel Construction and Tunnel Boring Machine (TBM)

Portions of the Underground Emphasis LRT Alternative and both Fully Underground LRT Alternatives along 2nd Street are anticipated to be bored using a pressurized face TBM(s) (Figure 4-2). TBMs are large-diameter horizontal drills that continuously excavate circular tunnel sections. Compared to the cut and cover method, tunnel boring is far less disruptive to surface traffic and adjacent land uses. The TBM would be advanced a small distance at a time (typically four to five feet) by means of hydraulic jacks, which push against a previously installed tunnel lining ring. The hydraulic jacks would then be retracted and another tunnel

lining ring would be installed. The machine would then be advanced again and the process would be repeated until the entire length of tunnel has been constructed. The excavated materials would be removed through the tunnel using hopper type rail cars or a conveyor system. As the TBM advances, it would support both the ground in front of it and the hole it creates using a shield and pre-cast concrete tunnel liners (Figure 4-4). This method creates a tunnel with little disruption at the surface, and is especially suitable for creating a circular opening at depths that would not be practical for cut and cover construction. Concrete tunnel liner segments would have rubber gaskets between them where necessary to prevent water from entering the tunnel, allowing excavation to proceed below the groundwater level.

TBMs require a launching shaft to start the tunneling operation. One option for a launching shaft for the TBM would be planned near the east end of the project, on 2nd Street between Central Avenue and Alameda Street. From the east end, the machine would bore westward along 2nd Street towards the 2nd/Hope Street Station site, passing through the proposed 2nd Street station area at either Broadway or Los Angeles Streets. The TBM would then be dismantled and retrieved through a vertical shaft created by cut and cover method adjacent to the 2nd/Hope Street Station. It would then be transported back to the launching shaft, and reassembled to repeat its journey for the second twin tunnel. An alternative tunnel boring approach is possible that would use a single, larger diameter tunnel instead of two smaller diameter tunnels. A single large TBM could be used to bore one tunnel big enough to contain both tracks and possible the station platforms. Further studies will determine if such an approach would be feasible for the Regional Connector. The TBM could also be launched from 2nd and Hope Streets and travel east toward 2nd and Alameda Streets. Launching two TBMs simultaneously from each end is an option as well.



Source: CDM 2009

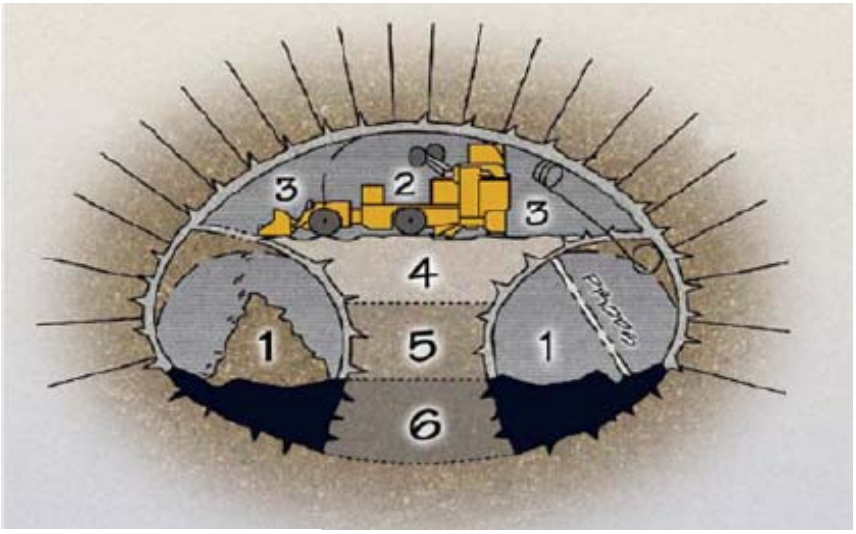
Figure 4-4. Tunnel Boring Machine (TBM) Method

The pre-cast concrete liners would be fabricated off-site and delivered by truck. Segment delivery would require 6 to 10 truck trips per day for the duration of tunneling, assuming an average excavation rate of 30 to 50 feet per day for a single tunnel. Should simultaneous tunneling occur, 12 to 20 truck trips would be required for segment delivery. Tunneling operation would typically be continuous, occurring seven days a week with two 10-hour shifts per day.

4.2.4.3 Sequential Excavation Method (SEM)

SEM construction involves excavating incrementally in small areas and supporting with steel supports beyond the opening and sprayed concrete as shown in Figure 4-5. Whereas TBMs can only excavate a fixed circular shape, SEM permits construction of a tunnel with a horseshoe or sub-rounded shape. This construction technique is considered in special instances where the planned depth, shape, or length of the tunnel may render it not cost effective using other methods. All operations would be conducted from an access shaft for spoils removal and future entrance(s). The sequence of excavation for the SEM method would be determined during the design stage and controlled and modified as needed during construction based on actual conditions encountered. After all of the predetermined sequence areas are excavated and supported, the larger area of the station would be completed.

Because of the depth of the 2nd/Hope Street station for the Underground Emphasis LRT and Fully Underground LRT Alternative – Little Tokyo Variations 1 and 2 , SEM construction is being considered as an alternative to the open cut method. Application of SEM would have less surface interruption than the cut and cover method since the excavation would be performed mostly underground and accessed via a vertical shaft.



Source: CDM. 2009

Figure 4-5. Sequential Excavation Method (SEM)

4.2.5 Additional Construction Activities

4.2.5.1 Construction of Underground Station and Portal Structures

The construction sequence for the station structure would begin with excavation of the station box, followed by the pouring of the foundation base slab, followed by the installation of exterior walls and any interior column elements. Slabs would be poured as the columns and intermediate floor and roof wall pours progress. Portal structures would use similar construction methods involving placement of concrete inverts, walls, and walkways. Station entrance locations would likely be used as access points to the underground station during the construction process. Exterior entrances would be constructed after the station structure has been completed.

4.2.5.2 Foundations and Tunnel Connection

Under the At-Grade Emphasis LRT Alternative, the connection to the existing 2nd Street Tunnel would require installation of a temporary shoring system, construction of retaining walls to support soil removal, reinforcement of the tunnel structure, and installation of supporting elements at the location of the new openings. This would not be required for the Underground Emphasis LRT Alternative, or the Fully Underground LRT Alterative Little Tokyo Variations 1 or 2.

4.2.5.3 Grade Separations

For the At-Grade Emphasis LRT Alternative, an underpass would be constructed at the intersection of Temple and Alameda Streets. For the Underground Emphasis LRT Alternative, an underpass would be constructed at the intersection of 1st and Alameda Streets. No underpass or pedestrian bridge would be required for the Fully Underground LRT Alternatives. The underpass would allow through traffic on Alameda Street to pass beneath Temple Street (At-Grade Emphasis LRT Alternative) and 1st Street (Underground Emphasis LRT Alternative) and the new rail junctions. In addition, pedestrian bridges could potentially be constructed above the Alameda Street underpass that would span the respective intersections for the At-grade Emphasis LRT Alternative and the Underground Emphasis Alternative. A pedestrian bridge could also possibly be constructed from the 2nd/Hope Street station to Upper Grand Avenue for all of the build alternatives. Bridge construction would involve heavy construction equipment, including cranes for erection of the structure. Underpass construction would involve installation of an appropriate shoring system followed by excavation to the required depth of the underpass. Lane closures and traffic rerouting would be required during construction. Currently, an existing modular wall system provides support for the existing rails at the Temple Street and 1st Street intersections. Lowering Alameda Street in these areas would require either underpinning the existing wall or constructing a new, higher replacement wall.

4.2.5.4 Operating Systems Installation

Operating systems for all of the build alternatives would include traction power, an overhead catenary system (OCS), a communications system, and a signal system. An OCS consists of poles connected to drilled shaft foundations with overhead wires to supply power to the trains. Within the tunnel segments, the OCS would be connected to the top of the tunnels. The system would include Traction Power Substations (TPSS) to provide direct power to the trains. TPSS facilities would include ground systems and prefabricated units which are placed on foundation slabs by crane and connected to the system. Construction equipment would include high rail vehicles for installation of the wires from the guideway area. While wires are being strung at cross streets, temporary street closures of a few hours at suitable times are anticipated. TPSS equipment would need to be installed adjacent to the alignment along at-grade segments, or within station boxes along underground segments.

4.2.5.5 Ventilation Shafts and Emergency Exits

The underground segments would include a number of ventilation and emergency exit areas in the vicinity of the underground stations. The stations would house emergency ventilation fan shafts, as well as separate emergency exit shafts at both ends of the stations. Ventilation fans would be installed to extracting smoke from tunnels and stairs for evacuation in the event of an emergency, such as a fire in the underground areas. The exact location of these facilities would be determined during the final design. These shafts would be built as extensions of the station excavations using cut and cover construction methods.

5.0 IMPACTS

This section addresses the construction-related adverse effects of the proposed alternatives, based on the implementation of the construction scenario described in Section 4. Each environmental topic that would have potential construction impacts is discussed. In addition, permanent impacts that would begin during the construction period are also identified, though they are analyzed in more depth in other technical reports.

5.1 No Build Alternative

Under the No Build Alternative, transit infrastructure investment would be limited to improvements planned for and funded in the 2009 Metro LRTP. By 2035, the Metro Expo Line to Santa Monica, Metro Purple Line to Westwood, Metro Crenshaw Line, and the Metro Gold Line to Azusa and I-605 will be in operation, and a number of bus services will have been reorganized and expanded to provide connections with these new rail lines. The transit network within the project area would otherwise be largely the same as it is now.

5.1.1 Direct Impacts

The No Build Alternative does not include the construction of any new facilities in the project area. Therefore, there would be no direct construction impacts under the No Build Alternative.

5.1.2 Indirect Impacts

The No Build Alternative does not include the construction of any new facilities in the project area. Therefore, there would be no indirect construction impacts under the No Build Alternative.

5.1.3 Cumulative Impacts

The No Build Alternative does not include the construction of any new facilities in the project area. Therefore, there would be no cumulative construction impacts under the No Build Alternative.

5.2 Transportation System Management (TSM) Alternative

Under the TSM Alternative, in addition to the provisions of the No Build Alternative, there would be two new express shuttle bus lines linking the 7th Street/Metro Center Station and Union Station. These buses would run frequently and may also have traffic signal priority similar to the Metro Rapid system to assist in the movement of buses within projected future traffic conditions. The traffic signal priority system grants longer green lights to oncoming transit vehicles. Enhanced bus stops would be located every two to three blocks, so as to maximize coverage of the area surrounding the routes. These new shuttles would also have minor associated structures, such as bus stops and signage. In addition, the same

infrastructure investments that would occur under the No Build Alternative would also occur under the TSM Alternative.

5.2.1 Direct Impacts

The TSM Alternative does not include the construction of any substantial new transit infrastructure. Transit infrastructure and improvements would be limited to the installation of new bus shelters and associated safety features. Construction of these facilities would occur on small localized sites and would occur over a very short term (days) compared to the Build Alternatives (years). Therefore, the TSM Alternative is not anticipated to result in any adverse environmental impacts.

5.2.2 Indirect Impacts

The TSM Alternative does not include the construction of any substantial new transit infrastructure. Transit infrastructure and improvements would be limited to the installation of new bus shelters and associated safety features and are not anticipated to result in any indirect adverse construction impacts.

5.2.3 Cumulative Impacts

The TSM Alternative does not include the construction of any substantial new transit infrastructure. Transit infrastructure and improvements would be limited to the installation of new bus shelters and associated safety features and are not anticipated to result in any cumulative adverse construction impacts.

5.3 At-Grade Emphasis LRT Alternative

The At-Grade Emphasis LRT Alternative extends from the underground 7th Street/Metro Center Station, heads north under Flower Street, resurfaces to at-grade north of 4th Street, crosses 3rd Street at-grade, enters Bunker Hill, and turns northeast through a new entrance to the existing 2nd Street tunnel. The alignment continues along 2nd Street and it splits into an at-grade couplet configuration traveling north on Main and Los Angeles Streets (one track on each roadway). It then heads east on Temple Street, realigns into a dual track configuration just east of Los Angeles Street, and connects to the Metro Gold Line tracks in a 3-way junction north of the Little Tokyo/Arts District Station on Alameda Street. Due to the high volume of trains that will traverse the Regional Connector Transit Corridor, an automobile underpass and pedestrian overpass will be constructed at the Temple and Alameda Streets to eliminate potential pedestrian-train and automobile-train conflicts. To implement this alternative, the number of traffic lanes and on-street parking on Temple Street, Main Street, Los Angeles Street, Flower Street and 2nd Street will be reduced.

Construction of the At-Grade Emphasis LRT Alternative would consist of the activities listed in Table 5-1. The At-Grade Emphasis LRT Alternative would require utility relocation and street

closures, staging areas necessary for equipment storage of excavated material, haul routes for construction equipment, the laying of surface track work, building of stations and portal structures, cut and cover construction, and excavation or installation of foundations. The analysis of the potential impacts that these construction activities could have are discussed for all environmental topic areas except for Land Use and Growth-Inducing Impacts because construction activities do not tend to have impacts in these topic areas.

5.3.1 Traffic and Parking

5.3.1.1 Direct Impacts

Permanent Impacts During Construction

Construction of the At-Grade Emphasis LRT Alternative would result in the permanent loss of approximately 47 on-street parking spaces and 33 on-street loading spaces, including 23 on-street parking spaces and five loading spaces on 2nd Street during off-peak hours. Three bus loading spaces in front of the Japanese American National Museum (JANM) on Alameda Street would be eliminated, but additional spaces are available on 1st Street, and replacement spaces would be identified in close proximity to the museum. The loss of on-street parking would result from the placement of tracks along streets. The details of these impacts and mitigation measures are presented in the Transportation Impacts Technical Memorandum and in the Displacement and Relocation of Existing Uses Technical Memorandum.

Table 5-1. Construction Activity Summary for the At-Grade Emphasis LRT Alternative

Activity	Duration (months)	Construction Equipment							Soil (CY)	Concrete (CY)	Truck Trips Per Day	Workers Per Day
		Haul Trucks	Concrete Truck	Dozer	Excavator	Crane	Drill Rig	Flatbed				
Pre-Construction	4-6						X	X	N/A	N/A	5	10-20
Site Preparation	6-12	X	X	X	X				<1,000	<500	10	20-30
Flower Street Cut and cover Tunnel	24-48	X	X	X	X	X	X	X	70,000	12,000	20-30	20-30
Flower/6th/5th Cut and cover Station	24-48	X	X	X	X	X	X	X	50,000	9,500	20-30	20-30
Portal on Flower South of 3rd Street	12-18	X	X	X	X	X	X	X	20,000	3,500	20-30	20-30
Portal NE of Flower/3rd Streets	TBD	X	X	X	X	X	X	X	10,600	4,000	20-30	20-30
2nd/Hope Sts Open Cut Station	24-28	X	X	X	X	X	X	X	55,000	17,500	20-30	20-30
New Portal into 2nd St Tunnel	TBD	X	X	X	X	X	X	X	40,000	11,700	TBD	TBD
Surface Track work	12-18	X	X	X	X	X		X	10,000	8,000	5-10	5-10

Table 5-1. Construction Activity Summary for the At-Grade Emphasis LRT Alternative

Activity	Duration (months)	Construction Equipment							Soil (CY)	Concrete (CY)	Truck Trips Per Day	Workers Per Day
		Haul Trucks	Concrete Truck	Dozer	Excavator	Crane	Drill Rig	Flatbed				
Main/Los Angeles Street Stations	12-18	X	X	X	X	X	X	X	<1,000	1,500	5-10	5-10
Temple/Alameda Junction	24-36	X	X	X	X	X	X	X	65,000	12,000	15-20	20-30
Operating Systems Install	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Source: CDM, 2009.

Construction-Related Impacts

Construction of the At-Grade Emphasis LRT Alternative would require the loss of on-street parking and reduction in travel lanes in certain locations. In most instances, these would be temporary conditions during the construction phase. In areas designated for cut and cover construction, the top two to three feet of the roadway would be removed and decking would be installed over an approximate three- to four-month period. Construction of the stations would continue underground while traffic operates normally on the decking. This procedure would require temporary off-peak, nighttime or weekend street closures to install the decking. The closure schedules would be coordinated to minimize impacts to residences, businesses, and traffic flow. During these times, traffic would be rerouted to adjacent streets via clearly marked detours.

Utility relocations, construction of the trackway, stations, and the proposed Alameda Street underpass at Temple Street would require the temporary closure of lanes on Flower Street, Hope Street in the vicinity of General Thaddeus Kosciuszko Way, Main Street, Los Angeles Street, Temple Street, 2nd Street, and Alameda Street. The track construction and permanent street configuration along 2nd Street would result in the elimination of eastbound vehicular travel on the segment of roadway between Hill Street and Main Street as well as the permanent closure of one eastbound travel lane between Main Street and Los Angeles Street. For the westbound direction of 2nd Street, a one lane permanent closure has been identified between Hill Street and Los Angeles Street. Travel times for vehicles traveling along the westbound direction of 2nd Street are expected to increase and eastbound vehicular through traffic would shift to 4th and 1st Streets. This shift would result in increased delay at several intersections between Hill Street and Los Angeles Street. Vehicular travel times and intersection operations along these roadways would potentially be impacted.

The construction of the proposed Alameda Street underpass at Temple Street would also result in the temporary reduction of roadway capacity for extended periods of time. In order to maintain two through travel lanes in each direction during construction activities, the two-way left turn median in the mid-block area and the exclusive right and left turn lanes at the intersection approaches would be temporarily eliminated over the two to three year period estimated to construct the underpass. The north and south intersection lane configurations would consist of a shared through and right turn lane and a shared through and left turn lane for the segment of Alameda Street between Aliso and 1st Streets. The existing signal phasing may be changed to split phasing in order to minimize conflicts between left turns and opposing through movements. This would minimize the formation of queues that could result from a vehicle waiting for a gap in the opposing traffic to complete a left turn movement. Consequently, travel times along this segment of Alameda Street are expected to increase due to the potential for additional traffic congestion. Also, operating conditions for the Alameda Street intersections between Aliso and 1st Streets are expected to experience increased delays.

Construction of the At-Grade Emphasis LRT Alternative would require use of heavy-duty trucks to transport equipment and excavated soil. The addition of these truck trips to the existing street network has the potential to adversely affect traffic. Haul and delivery truck routes would affect residents and commuters along the alignment. Soil hauling, rail and catenary deliveries, and general construction traffic would impact traffic flow patterns as well. Roadway surface restoration may be needed in areas that experience frequent project-related truck trips. These would be temporary conditions during the construction phase.

Existing on-street parking spaces and loading stalls would be temporarily removed during construction. This would potentially impact parking space and loading areas on the east and west sides of Flower Street, the loading areas on the east side of Main and Los Angeles Streets, and the parking spaces on the south side of Temple Street. In addition, the realigned intersection of Hope Street in the vicinity of General Thaddeus Kosciuszko Way may temporarily remove several parking spaces along both the east and west sides of the roadway segment. The track construction and permanent street configuration along 2nd Street would result in the temporary removal of several parking and loading stalls. Adjacent to the Alameda Street underpass, the JANM tour bus loading zone on the west side of the street would be temporarily relocated for the duration of the construction period.

Track construction, permanent street configuration changes along 2nd Street, and the construction of an underpass on Alameda Street may also require temporary sidewalk detours. As noted earlier, the construction along 2nd Street would shift some of the through traffic movements on to 1st Street, which is designated as a Class III bicycle route. Consequently, the flow of bicycle traffic could be hampered due to increased auto traffic volumes on 1st Street. The additional automobile traffic would result in increased turning movements, potentially reducing bicycle operating speeds or resulting in a greater risk of bicycle-automobile conflict, since Class III routes do not have bicycle-designated lanes. The construction of the underpass on Alameda Street may result in localized shifts in traffic to adjacent streets such as Central Avenue, which is also designated as a Class III bicycle route. Similarly, the increase in traffic volumes could potentially impact the flow of bicycle traffic. Temporary sidewalk detours during the construction of this alternative would also impact pedestrian flow.

Restoration of these parking, pedestrian and bicycle circulation, and travel lanes to their permanent configurations would occur prior to operations. Although short term, potentially adverse impacts are anticipated during construction of this alternative.

5.3.1.2 Indirect Impacts

Impacts from construction-related activities would be temporary and direct in nature. There would be no indirect impacts affecting traffic circulation or parking under the At-Grade Emphasis LRT Alternative.

5.3.1.3 Cumulative Impacts

Impacts to traffic circulation during construction would be short-term. They would contribute to a cumulative adverse effect when combined with additional projects in the downtown area. Therefore, potential cumulative adverse traffic circulation impacts are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.2 Displacements and Relocation

5.3.2.1 Direct Impacts

Permanent Impacts During Construction Period

To construct the At-Grade Emphasis LRT Alternative, 11 parcels would be partially acquired at different locations along the alignment. These properties would be utilized for TPSS facilities, construction staging, below grade tunneling, and stations. Details of these impacts and mitigation measures are presented in the Displacements and Relocation of Existing Uses Technical Memorandum.

Construction-Related Impacts

During construction of the At-Grade Emphasis LRT Alternative, staging of construction equipment and materials would require temporary construction easements that would impact two parcels. The portions of these parcels that would be utilized would be plazas and open areas. Access to businesses and buildings would be maintained. Some sidewalk detours would be necessary. Mitigation would minimize the adverse impacts associated with this type of displacement during construction. In addition, once construction is completed, the sites would be restored to their permanent conditions.

5.3.2.2 Indirect Impacts

Displacement impacts are direct in nature. Therefore, no indirect construction impacts associated with displacement are anticipated.

5.3.2.3 Cumulative Impacts

During construction, two temporary construction easements would be required. Given the temporary nature of these easements, the project is not anticipated to contribute to cumulative adverse construction impacts.

5.3.3 Community and Neighborhoods

5.3.3.1 Direct Impacts

Mobility would be reduced in the Civic Center, the Historic Core, and Little Tokyo areas due to street closures associated with construction activities including track work, cut and cover excavation, and structural support work. Disruption of traffic patterns would require detours for persons accessing nearby residences and businesses. In Little Tokyo, disruption to traffic

along Alameda Temple Streets would directly affect cultural institutions such as JANM, the Go For Broke Monument, and the Museum of Contemporary Art (MOCA) and other businesses during the excavation and construction of the Alameda Street underpass and the potential pedestrian bridge. Without mitigation, potential adverse construction impacts associated with community and neighborhoods are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.3.2 Indirect Impacts

During utility relocation, mobility would be reduced in the Civic Center, Historic Core, and Little Tokyo areas. Disruption of traffic patterns would require detours for persons accessing nearby residences and businesses. This could impact the economic vitality of some businesses, particularly in Little Tokyo, where the community has expressed concern about construction activities. Prolonged disruption to businesses could affect the cohesion of some communities, including Little Tokyo. Without mitigation, potential adverse indirect construction impacts associated with community and neighborhoods are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.3.3 Cumulative Impacts

No cumulative adverse construction impacts are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.4 Visual Resources and Aesthetics

5.3.4.1 Direct Impacts

Views and Visual Character

During construction of the At-Grade Emphasis LRT Alternative, several construction staging areas would be utilized. Construction areas would be protected by barriers. The placement of concrete barriers and fencing would be visible from multi-family residences and other sensitive uses adjacent to the alignment, particularly the Bunker Hill Towers, the Higgins Building, Hikari, and Savoy. Viewers would see construction equipment, construction-related activities, stockpiles of dirt and debris, and the urban streetscape would be temporarily altered. Screening of construction staging areas would minimize aesthetic impacts at street level. The project would be constructed in a heavily urbanized environment where construction activities are not uncommon, and the construction of the project would not noticeably reduce visual quality or alter viewing context. In Little Tokyo, large construction equipment would be required for the excavation and construction of the Alameda Street underpass and of the potential pedestrian bridge. This impact would be temporary and would be considered less than significant. Overall, less-than-significant impacts associated with views and visual character are anticipated due to construction activities.

Lighting

Temporary lighting may be necessary for nighttime construction, which minimizes disruption to daytime traffic and business activities and for nighttime lighting for staging sites, primarily for security. However, nighttime construction activities would be limited to non-residential areas and nighttime illumination of staging areas would be directed towards the site and away from sensitive uses. Therefore, less-than-significant impacts are anticipated.

5.3.4.2 Indirect Impacts

No indirect adverse construction impacts associated with visual resources are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.4.3 Cumulative Impacts

No cumulative adverse construction impacts associated with visual resources are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.5 Air Quality

5.3.5.1 Direct Impacts

Regional Construction Emissions

An analysis of construction-related emissions was completed in accordance with SCAQMD requirements. The estimate included emissions from off-road construction equipment, fugitive dust, construction worker commuting, and haul truck emissions. Table 5-2 provides a summary of anticipated construction emissions during peak operation for the entire project area.

Use of electric construction equipment could be encouraged where feasible. Daily regional construction emissions are anticipated to exceed SCAQMD regional significance thresholds for VOC, NO_x, CO, and $PM_{2.5}$ and would result in a potential adverse effect without mitigation.

Localized Construction Emissions

In addition to evaluating emissions on a regional level, construction emissions were also compared to SCAQMD's localized significance thresholds. The methodology includes using look-up tables for NOx, CO, PM_{10}, and $PM_{2.5}$. The tables show the maximum allowable emission levels given the project location, acreage, and distance to the nearest receptor. It was assumed that most project construction sites would be approximately one acre in size and located within 25 meters of a receptor. The maximum localized construction emissions would occur during cut and cover construction along Flower Street, and would result in maximum daily localized emissions of approximately 300 pounds per day (ppd) of NO_x, 150 ppd of CO, 14 ppd of $PM_{2.5}$ and 15 ppd of PM_{10}. Daily construction emissions are anticipated to exceed SCAQMD localized significance thresholds for NO_x, PM_{10}, and $PM_{2.5}$, and would result in a potentially adverse localized air quality effect.

Table 5-2. At Grade Emphasis LRT Alternative (2014-2017) Maximum Daily Construction Emissions

Daily Emissions (pounds/day)						
Location	VOC	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
Onsite	281	2,088	1,088	2	82	75
Offsite	8	87	62	<1	21	6
Total	**289**	**2,175**	**1,150**	2	102	**80**
Threshold	75	100	550	150	150	55
Significant	Yes	Yes	Yes	No	No	Yes

*Note: Emissions greater than threshold of significance are shown in **bold**.*
Source: CDM, Metro Regional Connector Air Quality Technical Memorandum, 2010

5.3.5.2 Indirect Impacts

The At-Grade Emphasis LRT Alternative would result in indirect emissions of TACs from construction. A TAC is an air pollutant that can cause or contribute to an increase in mortality or in serious illness, or may pose another potential hazard to human health. Common TACs associated with mobile sources, such as passenger vehicles and construction equipment, include toluene, xylenes, acrolein, and DPM, among others. A Tier 1 risk assessment was included, which compares TAC emission levels to published screening limits. Only acute risks were reviewed because of the temporary nature of these potential impacts. Speciation profiles from CARB were used to estimate emissions of TACs from construction. The profiles for diesel vehicle exhaust (profile no. 425) and construction dust (profile no. 420) were used in the analysis. A summary of project-related emissions and Health Risk Assessment (HRA) results are provided in Table 5-3. Since volatile organic compound (VOC) emissions will decrease in future years because of improvements in engine technology, the HRA was not completed for VOC emissions. Instead, it was restricted to inorganic emissions. The At-Grade Emphasis LRT Alternative would not result in an adverse effect due to TAC construction emissions.

5.3.5.3 Cumulative Impacts

Daily regional and localized construction emissions are anticipated to exceed SCAQMD regional significance thresholds and would result in a potentially adverse cumulative effect without mitigation.

Table 5-3. At-Grade Emphasis LRT Alternative (2014-2017) Construction Health Risk Assessment				
TAC	**CAS #**	**Emissions (lb/hr)**	**PSL (lb/hr)**	**PSI**
Arsenic	7440-38-2	1.74E-05	1.00E-04	1.74E-01
Chlorine	7782-50-5	1.27E-03	1.05E-01	1.21E-02
Copper	7440-50-8	8.76E-05	5.00E-02	1.75E-03
Mercury	7439-97-6	1.01E-04	9.00E-04	1.12E-01
Nickel	7440-02-0	6.58E-05	3.00E-03	2.19E-02
			Application Screening Index (Total PSI)	3.22E-01
			Threshold	1

Notes:
TAC = Toxic Air contaminant
CAS = Chemical Abstracts Service
PSL = pollutant screening level (minimum level expected to exceed health risk)
PSI = pollutant screening index (PSL divided by project emissions)
ASI = application screening index (total PSI)
lb/hr = pounds per hour
Source: CDM, Metro Regional Connector Air Quality Technical Memorandum, 2010

5.3.6 Noise and Vibration

5.3.6.1 Direct Impacts

Anticipated construction activities, equipment, and related noise levels are shown in Table 5-4. Construction of the At-Grade Emphasis LRT Alternative would potentially generate noise and vibration from excavators, bulldozers, trenchers, drill rigs, cranes, and heavy-duty trucks used to transport construction equipment. According to the City of Los Angeles *2006 CEQA Thresholds Guide*, this type of construction activity would generate a maximum noise level of 90 dBA at 50 feet. The construction activities and locations with the greatest potential for noise impacts are: the Flower Street cut and cover tunnel, Flower/6th/5th Street station cut and cover construction, 2nd/Hope Street station open cut construction, and construction of the junction and underpass at Temple and Alameda Streets. These four activities have the greatest potential for noise impacts due to the extended duration of work and proximity to noise-sensitive land uses. Potential adverse effects from construction noise are anticipated if mitigation measures are not implemented.

Table 5-4. Construction Activity and Equipment Typical Noise Levels in dBA at 50 feet from Source for the At-Grade Emphasis LRT Alternative

Activity	Duration (months)	Construction Equipment				
		Concrete Truck	Dozer	Excavator	Crane	Drill Rig
Pre-Construction	4-6	NA	NA	NA	NA	90
Site Preparation	6-12	77	85	82	NA	NA
Flower Street Cut and cover Tunnel	24-48	77	85	82	81	90
Flower/6th/5th Cut and cover Station	24-48	77	85	82	81	90
Portal on Flower South of 3rd	12-18	77	85	82	81	90
Portal northeast of Flower and 3rd	TBD	77	85	82	81	90
2nd/Hope Street Open Cut Station	24-28	77	85	82	81	90
New Portal into 2nd Street Tunnel	TBD	77	85	82	81	90
Surface Track work	12-18	77	85	82	81	NA
Main and Los Angeles At-Grade Stations	12-18	77	85	82	81	90
Temple and Alameda Junction	24-36	77	85	82	81	90
Operating Systems Installation	TBD	TBD	TBD	TBD	TBD	TBD

Source: CDM, Metro Regional Connector Noise and Vibration Technical Memorandum, 2010.

The potential for GBV to cause damage to buildings varies based on type of building, building materials, structural techniques, and distance from construction activities. Thresholds are described in the Noise and Vibration Impacts Technical Memorandum, Tables 3-4 and 3-5. Pre-auguring would likely be necessary for installation of the soldier piles. During pre-augering, the holes for the piles would first be drilled and then the piles would be cast in place. Using the minimum safe distance for Category IV (0.12 inch/sec PPV), the potential worst case vibration category, vibration from construction equipment during construction of the At-Grade Emphasis LRT Alternative would result in an adverse effect if it occurred less than 21 feet from buildings. A pre-construction survey of structures within 21 feet of the anticipated construction zone would be conducted to assess potential for GBV to cause

damage, and to establish baseline pre-construction conditions. Because impact type construction equipment such as pile drivers and hoe rams would not be used, no construction vibration impacts related to impact type equipment are anticipated.

Vibration from large bulldozers and drill rigs could exceed the FTA annoyance criteria for sensitive receptors identified in the Noise and Vibration Technical Memorandum, Table 3-2. However, perceptible vibration from construction equipment would be short-term and intermittent. Therefore, perceptible vibration from the construction equipment is considered an "infrequent event," less than 30 events a day as defined by FTA. Sensitive receptors located along the alignment are considered Category 2 and Category 3 land uses under the FTA annoyance criteria. Short-term vibration levels during construction could exceed the FTA annoyance criteria if the identified construction equipment operates within 20 feet of Category 2 land uses or within 16 feet of Category 3 land uses. After incorporating the adjustment of 10 dBA for coupling to building foundation loss (Table 10-1, FTA, 2006), occupants would not be subject to vibration levels above the FTA annoyance criteria. It should be noted that large bulldozers and drill rigs would operate intermittently and would not be used during every day of construction. Without the implementation of mitigation measures, potentially adverse effects from vibration could occur.

5.3.6.2 Indirect Impacts

Impacts from construction-related activities are temporary and direct in nature. No indirect impacts are anticipated from noise or vibration under the At-Grade Emphasis LRT Alternative.

5.3.6.3 Cumulative Impacts

Impacts from noise and vibration during construction would be short term and would not contribute to a cumulative adverse effect. Therefore, no cumulative adverse noise or vibration impacts are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.7 Geotechnical/Subsurface/Seismic/Hazardous Materials

5.3.7.1 Direct Impacts

Geotechnical/Subsurface/Seismic

The At-Grade Emphasis LRT Alternative proposed alignment does not cross any known faults. However, portions of the proposed alignment occur in areas mapped with the potential for liquefaction based on soil stability. Areas susceptible to liquefaction are along Flower Street between Wilshire Boulevard and 2nd Street, and along 2nd Street between Hill and San Pedro Streets. The eastern edge of the alignment near the intersection of 1st and Temple Streets is within the mapped Inundation Hazard Area. In addition, the proposed 2nd/Hope Street Station is within the Hillside Ordinance area (Bunker Hill).

During construction of underground stations, portal structures, and the Alameda Street underpass, there is the potential for adverse impacts related to ground settlement and

differential settlement on adjacent structures including historical buildings. Further evaluation and survey would be performed during final design to establish building types and existing conditions, and to develop criteria to limit potential movement to acceptable threshold values. Protection of buildings could involve design of adequately rigid excavation support systems, underpinnings, and ground improvements to minimize settlement to tolerable limits. A preconstruction survey of the adjacent structures and all historical buildings in the vicinity would be conducted to establish a baseline for measuring potential construction-induced damage. Construction monitoring would be required to ensure that ground movement does not exceed threshold values. With mitigation, less-than-significant impacts are anticipated.

Construction of surface track work, stations, and portals would likely require removal of protective vegetation or pavement that would increase the potential for soil erosion. With mitigation, potential adverse construction impacts associated with subsurface soils would be less than significant.

Hazardous Materials

Construction of the At-Grade Emphasis LRT Alternative would entail excavation along most of the proposed alignment, during which contaminated soil and groundwater could be encountered. As listed in Table 4-5 of the Geotechnical/Subsurface/Seismic/Hazardous Materials Technical Memorandum, known and suspected soil and groundwater contamination exists at properties along the proposed alignment for the At-Grade Emphasis LRT Alternative. Lead may be present in surface soils from historical vehicle emissions of older automobiles using leaded gasoline, and PCBs may exist in surface or subsurface soils from leaking transformers. If released during excavation, there is potential for these hazardous materials to impact human health and the environment. Until further study is conducted, the actual levels of hazardous materials that could be encountered in soil and groundwater during construction are unknown. Without mitigation, potential adverse impacts are anticipated.

5.3.7.2 Indirect Impacts

No indirect adverse construction geotechnical, subsurface, seismic, or hazardous materials impacts are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.7.3 Cumulative Impacts

No cumulative adverse construction geotechnical, subsurface, seismic, or hazardous materials impacts are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.8 Water Quality

5.3.8.1 Direct Impacts

According to the Geotechnical/Subsurface/Seismic/ Hazardous Materials Technical Memorandum and the Water Resources Technical Memorandum, there is known and suspected soil and groundwater contamination along the proposed alignment. Construction activities have the potential to increase erosion and sedimentation around proposed construction and staging areas. Grading activities associated with construction could potentially result in a temporary increase in the amount of suspended solids running off construction sites. In the case of a storm event, construction site runoff could result in sheet erosion of exposed soil. Groundwater may be encountered during trenching or tunneling, and would require dewatering. Dewatering activity would result in the potential release of contaminated water due to the presence of relatively shallow groundwater (located at depths ranging from 14 to 36 feet) that is contaminated with pollutants common to urban development. All dewatering activity would occur with a NDPES permit. Testing would occur prior to construction and on-site treatment and discharge in accordance with applicable standards or transport to a treatment or disposal facility would be required. Without mitigation, potential adverse construction impacts associated with water quality are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.8.2 Indirect Impacts

No indirect adverse construction impacts associated with water quality are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.8.3 Cumulative Impacts

No cumulative adverse construction impacts associated with water quality are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.9 Energy

5.3.9.1 Direct Impacts

The highest direct energy consumption would occur during site clearance and construction guideways, stations, and support facilities. . Construction of the At-Grade Emphasis LRT Alternative would result in the one-time, non-recoverable energy cost of of 3,457 billion British Thermal Units (BTUs). This impact would be temporary, and the project would result in long-term, beneficial decreases in energy use in the region. LADWP is committed to increasing electricity generation from renewable energy sources and ensuring a reliable flow of electricity to users in its service area. Given the long-term, beneficial decreases in energy use associated with this alternative, potential construction-related impacts would be less-than significant.

5.3.9.2 Indirect Impacts

No indirect adverse construction impacts associated with energy are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.9.3 Cumulative Impacts

No cumulative adverse construction impacts associated with energy are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.10 Climate Change

5.3.10.1 Direct Impacts

No direct adverse construction impacts associated with climate change are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.10.2 Indirect Impacts

No indirect adverse construction impacts associated with climate change are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.10.3 Cumulative Impacts

The construction of the At-Grade Emphasis LRT Alternative would result in Greenhouse Gas (GHG) emissions from diesel-fueled construction equipment. Construction emissions would result from the use of onsite equipment, offsite worker vehicles, and offsite haul trucks. A total of approximately 76,400 metric tons per year of GHG emissions would be produced during all phases of construction under the At-Grade Emphasis LRT Alternative.

The At-Grade Emphasis LRT Alternative would result in a decrease in GHG emissions compared to the No Build Alternative and, because of regional growth unrelated to the project, an increase in GHG emissions compared to existing conditions (2009). The At-Grade Emphasis LRT Alternative is consistent with CARB's Scoping Plan requirement to reduce GHG emissions. It is expected that other projects operating in 2035 would be consistent with the emission reduction targets of SB 375 and the Regional Transportation Plan. As a result, emissions would not be cumulatively significant.

5.3.11 Historic, Archaeological, and Paleontological Resources

5.3.11.1 Direct Impacts

Historic Resources

Potential effects, but no adverse effects, would result from dirt from construction activities, changes in access during construction, visual changes during construction, demolition and partial takes, construction of at-grade stations, installation of catenary poles and TPSS. The effects would be short-term and would not alter characteristics of historic properties in a

manner that would diminish the integrity of the properties' location, design, setting, materials, workmanship, feeling, or association.

In applying the criteria of adverse effect for historic properties (36 CFR 800.5(a)(1)) potentially affected by the construction near 2nd Street, an adverse effect would occur due to the demolition of a portion of the NRHP eligible 2nd Street Tunnel and the subsequent change in use. The changes would directly alter a characteristic of the historic property in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Documentation of the property in accordance with mitigation measure MM-BE-1 would resolve the potential adverse effect.

At least seven NRHP and/or CRHR eligible properties could be potentially affected by cut and cover construction, differential settlement, and construction noise and vibration associated with construction of the At-Grade Emphasis LRT Alternative. The implementation of design measures would protect and stabilize the ground near historic properties as noted in MM-BE-2, MM-BE-3, and MM-BE-5. These measures would avoid adverse effects to all properties. If properly implemented, short term construction activities would not directly alter a characteristic of the historic property in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

Archaeological Resources

The At-Grade Emphasis LRT Alternative has the potential to alter, remove, or destroy archaeological resources within the APE. Site RC-1, a historic brick alignment, may be affected during ground disturbance from construction of a proposed pedestrian bridge at the intersection of Temple and Alameda Streets.
Site RC-1 appears to be not eligible for National Register or California Register listing. However, previously unrecorded parts of the site that retain substantial integrity may be present. This alternative also has the potential to affect previously unrecorded archaeological resources during ground disturbance from constructing new underground tunnel segments on Flower Street between 7th Street and Hope Street; new stations proposed at Main/1st Streets, Los Angeles/1st Streets, 2nd/Hope Streets, and Flower/6th/5th Streets; and an automobile underpass and pedestrian overpass on Alameda Street at Temple Street. Such damage to archaeological resources would represent a significant effect that could be mitigated. Implementing MM-A-1 (see Section 6.1) would reduce this effect to a less-than-significant level.

Paleontological Resources

The At-Grade Emphasis LRT Alternative has the potential to adversely impact paleontological resources at the surface and at depth within the project area as a result of ground disturbance related to construction of new underground tunnel segments between 7th and Hope Streets and at new proposed stations at Flower/6th/5th Street, 2nd/Hope Street, Main/1st Street, and Los

Angeles/1st Street. Any ground disturbances in areas of high sensitivity (See Figure 4-3) will have the potential to impact paleontological resources at the surface and at depth; area ground disturbance in areas of sensitivity ranging from low to high have the potential to impact paleontological resources at a depth of 5 feet or greater below the ground surface. In areas where proper mitigation measures (Section 6.1) can be implemented, potential impacts can be reduced to a less than significant level.

5.3.11.2 Indirect Impacts

The construction of the At-Grade Emphasis LRT Alternative would have the potential to indirectly impact historical resources during cut and cover construction, underpass construction at Alameda and Temple Streets, and during construction of the new portals into the 2nd Street tunnel. The potential impacts would be indirect because the construction activities themselves would not damage historical properties, but vibration and possible subsidence of soils could potentially impact the historical integrity of buildings. Mitigation would minimize the potential adverse impacts.

5.3.11.3 Cumulative Impacts

No cumulative adverse construction impacts associated with historical, archaeological, or paleontological resources are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.12 Ecosystems and Biological Resources

5.3.12.1 Direct Impacts

During construction of the At-Grade Emphasis LRT Alternative, some mature trees located along the proposed alignment could be removed. As these mature trees may provide potential nesting and roosting habitat for bird species, including raptors, removal or disturbance of this vegetation during the nesting season could directly impact this habitat and any bird species that are present. There are currently approximately 250 mature trees in the area that could potentially be affected by construction, and some of these trees could be removed or disturbed. Approximately 60 of the trees are native California sycamore trees, a protected species. Potential mitigation measures are described in Section 6 and include compliance with the Native Tree Protection Ordinance. Compliance with the Native Tree Protection Ordinance, including replacement of this protected species at a 2:1 ratio, would reduce this potential impact to a less than significant level.

5.3.12.2 Indirect Impacts

Direct impacts to birds and their habitat by removing or disturbing mature trees have the potential to cause indirect impacts elsewhere. If birds are forced to relocate to new areas during the nesting season, increased competition for food and nesting habitat would be a potential indirect impact.

However, because the downtown area provides only low quality habitat for migratory birds, these potential impacts are not considered to be significant because only a small number of birds (if any) could be displaced. Further, mitigation taken to comply with the Migratory Bird Treaty Act (MBTA) and the California Fish and Game Code would reduce potential indirect impacts to a less-than-significant level.

5.3.12.3 Cumulative Impacts

No cumulative adverse construction impacts associated with ecosystems or biological resources are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.13 Parklands and Other Community Facilities

5.3.13.1 Direct Impacts

During construction of the At-Grade Emphasis LRT Alternative, access to the parking structure beneath Maguire Gardens and pedestrian access to the gardens and the City Hall Park could potentially be reduced, but not eliminated, due to street closures and construction activities. Discrete locations along the alignment that could experience modified pedestrian and vehicle access during construction and operation include the new Los Angeles Police Department (LAPD) headquarters, the State of California Department of Transportation (Caltrans) building, City Hall, City Hall East, the U.S. Federal Government Building (Roybal Center), the Los Angeles Ambulatory Care Center, the fire station on Temple Street, and the Little Tokyo Branch Public Library. Disruption of traffic patterns would restrict access to certain community resources such as the MOCA, JANM, and the Go for Broke Monument. This would have the potential to affect annual festivals and events held in the downtown area during the construction period. Response times for emergency services could also be impacted due to street closures and detours. Without mitigation, potential adverse construction impacts associated with parklands and other community facilities are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.13.2 Indirect Impacts

Although construction impacts are direct by nature, the construction of the At-Grade Emphasis LRT Alternative alignment could potentially discourage patrons of community facilities and parks to visit them due to restricted access and temporary parking restrictions. Without mitigation, potential adverse impacts are anticipated.

5.3.13.3 Cumulative Impacts

No cumulative adverse construction impacts associated with parklands or other community facilities are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.14 Economic Vitality and Employment Opportunities

5.3.14.1 Direct Impacts

Construction of the At-Grade Emphasis LRT Alternative would directly impact several businesses located along the alignment due to lane closures, sidewalk detours and restricted street parking during track installation and cut and cover activities. These businesses, including Pitfire Pizza, China Bistro, and the Kawada Hotel among others, primarily rely on vehicular and pedestrian traffic for revenue generation. The Economic and Fiscal Impacts Technical Memorandum provides a list of businesses along the proposed alignment that would likely be affected by the track installation and street closures during construction. In addition, temporary closures or restricted access to Alameda Street during construction of the underpass and pedestrian bridge would impact a heavily utilized truck route and restrict freeway access to Little Tokyo. Cultural institutions, such as MOCA and JANM, could potentially be impacted directly and other businesses indirectly. Investment in transportation, including direct investment in the form of capital construction and operation costs, provides economic benefits in several basic ways: the creation of direct and indirect jobs, and spending by suppliers whose goods and services are used in the project. These benefits are discussed in the Economic and Fiscal Impacts Technical Memorandum. The benefits of the additional transit infrastructure in the long-term would outweigh the temporary significant impacts in the project area.

5.3.14.2 Indirect Impacts

No indirect adverse construction impacts associated with economic vitality are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.14.3 Cumulative Impacts

No cumulative adverse construction impacts associated with economic vitality are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.15 Safety and Security

5.3.15.1 Direct Impacts

The contractor will have a safety plan and be responsible for construction site security in conformance with local regulations and standards. Construction activities are not anticipated to affect security in the project area. Typically construction areas are fenced off with restricted access and are well lit. No direct adverse impacts associated with safety or security are anticipated.

5.3.15.2 Indirect Impacts

No indirect adverse construction impacts associated with safety or security are anticipated under the At-Grade Emphasis LRT Alternative.

5.3.15.3 Cumulative Impacts

No cumulative adverse construction impacts associated with safety or security are anticipated under the At-Grade Emphasis LRT Alternative.

5.4 Underground Emphasis LRT Alternative

The Underground Emphasis LRT Alternative would extend from the 7th Street/Metro Center Station north beneath Flower Street with a new underground station north of 5th Street. At 2nd Street, the underground tunnel would extend east with a new underground station near 2nd and Hope Streets to provide access to Bunker Hill. A pedestrian bridge could potentially be constructed to connect the 2nd/Hope Street station to Upper Grand Avenue. A second underground station would be located either between Broadway and Spring Street or between Main and Los Angeles Streets. The tunnel would emerge to at-grade connections just southwest of the intersection of 1st and Alameda Streets. At 1st and Alameda Streets, a new underpass would carry car and truck traffic along Alameda Street below the rail junction, and a new overhead pedestrian bridge structure would eliminate most conflicts between pedestrians and trains. This alternative would have a single at-grade crossing at the intersection of 1st and Alameda Streets.

Construction of the Underground Emphasis LRT Alternative would consist of the activities listed in Table 5-5 and would require utility relocation, street closures, creation of staging areas necessary for equipment storage, creation of haul routes for construction equipment and excavated materials, laying of surface track work, cut and cover station excavation, portal construction, excavation or installation of foundations, and possible SEM station construction.

The analysis of the potential impacts that these construction activities could have are discussed for all environmental topic areas except for Land Use and Growth-Inducing Impacts because construction activities do not tend to have impacts in these topic areas.

5.4.1 Traffic and Parking

5.4.1.1 Direct Impacts

Permanent Impacts During Construction

Construction of the Underground Emphasis LRT Alternative would result in the permanent loss of approximately 20 on-street parking spaces. Three bus loading spaces in front of JANM on Alameda Street would be eliminated, but additional spaces are available on 1st Street, and replacement spaces would be identified in close proximity to the museum. The details of these project impacts and mitigation measures are presented in the Transportation Technical Memorandum and the Displacements and Relocation of Existing Uses Technical Memorandum.

Construction-Related Impacts

Construction of the Underground Emphasis LRT Alternative would require the loss of on-street parking and reduction in travel lanes in certain locations. In most instances, these would be temporary conditions during the construction phase. In areas designated for cut and cover or SEM construction, the top two to three feet of the roadway would be removed, and decking would be installed over an approximate three- to four-month period. Construction of the stations would continue underneath while traffic operates normally on the decking. This procedure would require temporary off-peak, nighttime and weekend street closures to install the decking. The closure schedules would be coordinated to minimize impacts to residences, businesses, and traffic flow. As these street closure requirements are identified, traffic would be rerouted to adjacent streets with detours clearly signed and marked.

Utility relocations, track installation, station construction, and construction of the proposed Alameda Street underpass at 1st Street would require the temporary closure of lanes on Flower Street, Hope Street in the vicinity of General Thaddeus Kosciuszko Way, 2nd Street, 1st Street, and Alameda Street. This would result in a reduction of roadway capacity and potentially the modification of existing traffic patterns to bypass congested areas. Vehicular travel times and intersection operations along these roadways would potentially be impacted. The construction of the proposed Alameda Street underpass at 1st Street would also result in the reduction of roadway capacity for extended periods of time. In order to maintain two through travel lanes in each direction during construction activities, the two-way left turn median in the mid-block area and the exclusive right and left turn lanes at the intersection approaches would be temporarily eliminated over the two to three year period estimated to construct the underpass. The north-south intersection lane configurations would consist of a shared through and right turn lane and a shared through and left turn lane on Alameda Street between Aliso and 1st Streets. In addition, the existing signal phasing may be changed to split phasing in order to minimize conflicts between left turns and opposing through movements, and to minimize the formation of queues behind vehicles waiting for gaps in opposing traffic to complete left turn movements. Consequently, travel times along this segment of Alameda Street are expected to increase due to the potential for increased traffic congestion. Also, operating conditions for the Alameda Street intersections between Aliso and 1st Streets are expected to deteriorate.

Table 5-5. Construction Activity Summary for the Underground Emphasis LRT Alternative												
Activity	Duration (months)	Construction Equipment							Soil (CY)	Concrete (CY)	Truck Trips Per Day	Workers Per Day
		Haul Trucks	Concrete Truck	Dozer	Excavator	Crane	Drill Rig	Flatbed				
Pre-Construction	4-6						X	X	N/A	N/A	5	10-20
Site Preparation	12-18	X	X	X	X				<1,000	1,000	10-20	20-30
Flower Street Cut and cover Tunnel	24-48	X	X	X	X	X	X	X	280,000	27,750	20-30	20-30
Flower/5th/4th Cut and cover Station	24-48	X	X	X	X	X	X	X	105,000	26,000	15-20	20-30
Cut and cover Approach to 2nd/Hope Streets Station	24-48	X	X	X	X	X	X	X	30,000	5,500	15-20	20-30
2nd/Hope St Station (SEM)	24-48	X	X	X	X	X	X	X	50,000	8,250	10-15	20-25
2nd/Hope St Station (Open Cut)	24-48	X	X	X	X	X	X	X	147,500	17,250	20-30	20-30
2nd St TBM Tunnel	24-48	X	X	X	X	X		X	120,000	Pre-Cast	35-70	15-20
2nd St Cut and cover Station (Broadway Option)	24-48	X	X	X	X	X	X	X	200,000	47,250	15-20	15-20
2nd St Cut and cover Station (Los	24-48	X	X	X	X	X	X	X	175,000	48,500	15-20	15-20

Table 5-5. Construction Activity Summary for the Underground Emphasis LRT Alternative												
Activity	Duration (months)	Construction Equipment							Soil (CY)	Concrete (CY)	Truck Trips Per Day	Workers Per Day
		Haul Trucks	Concrete Truck	Dozer	Excavator	Crane	Drill Rig	Flatbed				
Angeles St Option)												
Portal	12-24	X	X	X	X	X	X	X	20,000	7,500	TBD	TBD
TBM Launch Site	24	X	X	X	X	X	X	X	20,000	N/A	5-10	15-20
1st/ Alameda Junction	24-36	X	X	X	X	X		X	65,000	12,000	15-20	20-30
Operating Systems Install	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Source: CDM, 2009.

Construction of the Underground Emphasis LRT Alternative would require the use of heavy-duty trucks to transport equipment and excavated soil. The addition of these trucks to the existing street network has the potential to adversely affect traffic and parking. The additional excavated soil necessary to construct the underground segment along 2nd Street would require more haul trucks than the At-Grade Emphasis LRT Alternative. Haul and delivery truck routes would affect residents and commuters along the proposed alignment. Tunnel spoil hauling, rail and catenary deliveries, and general construction traffic would impact traffic flow as well. Roadway surface restoration may be needed in areas that experience frequent project-related truck trips. These would be temporary conditions during the construction phase.

Lane closures during construction on Flower Street, Hope Street in the vicinity of General Thaddeus Kosciuszko Way, Main Street, 2nd Street, 1st Street, and Alameda Street would result in the temporary removal of existing on-street parking spaces and loading stalls. This would impact parking spaces and loading areas on the both sides of Flower Street, on 2nd Street between Spring and Alameda Streets, on Central Avenue and Alameda Street between 1st and 2nd Streets, and on 1st Street between San Pedro and Hewitt Streets. In addition, the realigned intersection of Hope Street in the vicinity of General Thaddeus Kosciuszko Way may temporarily remove several parking spaces along both the east and west sides of the roadway segment. In the vicinity of the Alameda Street underpass, the JANM tour bus loading zone on the west side of the street would be temporarily removed and relocated for the duration of the construction period.

Cut and cover station construction along segments of Flower Street and construction of the underpass on Alameda Street may require temporary sidewalk detours, which could potentially impede pedestrian flow. However, pedestrian flow on 2nd Street would be better under this alternative than the At-Grade Emphasis LRT Alternative. In addition, the construction of the underpass on Alameda Street may result in localized shifts in traffic to adjacent streets such as Central Avenue, which is designated as a Class III bicycle route. The flow of bicycle traffic could potentially be impacted due to increased traffic volumes on Central Avenue. The additional automobile traffic would result in increased turning movements, potentially reducing bicycle operating speeds or resulting in a greater risk of bicycle-automobile conflict, since Class III routes do not have bicycle-designated lanes.

Restoration of the curb parking spaces, pedestrian facilities, bicycle lanes, and auto lanes to their permanent configuration would occur prior to operations. Potential short term, adverse impacts are anticipated during construction of this alternative.

5.4.2.1 Indirect Impacts

Impacts from construction-related activities are temporary and direct in nature. No indirect impacts to traffic circulation or parking are anticipated under the Underground Emphasis LRT Alternative.

5.4.2.2 Cumulative Impacts

Impacts to traffic circulation during construction would be short term. However, they would contribute to a potential cumulative adverse effect when combined with other projects in the downtown area. Therefore, potential cumulative adverse traffic circulation impacts are anticipated under the Underground Emphasis LRT Alternative.

5.4.2 Displacements and Relocation

5.4.2.1 Direct Impacts

Permanent Impacts During Construction Period

To construct the Underground Emphasis LRT Alternative, 11 full takes, ten partial takes, and four permanent underground easements would be required at different locations along the alignment. These properties would be utilized for TPSS facilities, construction staging, below grade tunneling, and station construction. The details of these impacts and mitigation measures are presented in the Displacements and Relocation of Existing Uses Technical Memorandum.

Construction-Related Impacts

During construction of the Underground Emphasis LRT Alternative, creation of staging areas would require temporary easements that would impact eight parcels. The portions of these parcels that would be utilized would be plazas and open areas. Access to businesses, existing buildings, and sidewalks would be maintained, though detour routes may be required. Mitigation would minimize the adverse impacts associated with this type of displacement during construction. Once construction is completed, the sites would be restored to their permanent conditions.

5.4.2.2 Indirect Impacts

Displacement impacts are direct in nature. Therefore, no indirect construction impacts associated with displacement are anticipated.

5.4.2.3 Cumulative Impacts

No cumulative adverse construction impacts associated with displacements or relocation are anticipated under the Underground Emphasis LRT Alternative.

5.4.3 Community and Neighborhoods

5.4.3.1 Direct Impacts

Mobility would be reduced in the Financial District, Bunker Hill, Civic Center, the Historic Core, and Little Tokyo areas due to street closures associated with construction activities including track installation at 1st and Alameda, cut and cover excavation, and structural support work. Disruption of traffic patterns would restrict, but not eliminate, access to

residences and businesses. In Little Tokyo, disruption to traffic along Alameda and 1st Streets would directly affect cultural institutions such as JANM, the Go for Broke Monument, MOCA, and other businesses during the excavation and construction of the Alameda Street underpass and the potential pedestrian bridge. In addition, the installation of TBMs either in the Little Tokyo or Bunker Hill areas would temporarily disrupt communities, businesses, and residents. Buildings likely to experience disruption include Savoy and Honda Plaza in Little Tokyo, and the Bunker Hill Towers. Without mitigation, potential adverse construction impacts associated with community and neighborhoods are anticipated under the Underground Emphasis LRT Alternative.

5.4.3.2 Indirect Impacts

During utility relocation, mobility would be temporarily reduced in the Financial District, Bunker Hill, Civic Center, Historic Core, and Little Tokyo areas. Disruption of traffic patterns would temporarily restrict access to residences and businesses. This could impact the economic vitality of some businesses, particularly in Little Tokyo, where the community has expressed concern about construction activities. Prolonged disruption to businesses could affect community cohesion. Without mitigation, potential adverse indirect construction impacts associated with community and neighborhoods are anticipated under the Underground Emphasis LRT Alternative.

5.4.3.3 Cumulative Impacts

No cumulative adverse construction impacts associated with communities or neighborhoods are anticipated under the Underground Emphasis LRT Alternative.

5.4.4 Visual Resources and Aesthetics

5.4.4.1 Direct Impacts

Views and Visual Character

During construction of the Underground Emphasis LRT Alternative, several construction staging areas would be utilized. These staging areas and the areas where the TBMs will be deployed, either in Little Tokyo or Bunker Hill, would be separated from non-construction areas by barriers. The placement of concrete barriers with fencing would be visible from multi-family residences and other sensitive uses adjacent to the alignment, particularly the Bunker Hill Towers, Hikari, and Savoy. Viewers would see construction equipment, construction-related activities, and stockpiles of dirt and debris, and the urban streetscape would be temporarily altered. Screening of construction staging areas would minimize aesthetic impacts at street level. The project would be constructed in a heavily urbanized environment where construction activities are not uncommon, and the construction of the project would not noticeably reduce visual quality or alter viewing context. Visual character impacts would be limited to construction staging areas and would occur to a lesser extent than under the At-Grade Emphasis LRT Alternative. In Little Tokyo, large construction

equipment would be required for the excavation and construction of the Alameda Street underpass and the potential pedestrian bridge. These impacts would be temporary and less than significant. Overall, less-than-significant impacts associated with views and visual character are anticipated.

Lighting

Temporary lighting may be necessary for nighttime construction, which is sometimes scheduled in order to minimize disruption to daytime traffic and for nighttime lighting for staging sites, primarily for security. However, nighttime construction activities would be limited to non-residential areas and nighttime illumination of staging areas would be directed towards the site and away from sensitive uses. Therefore, less-than-significant impacts are anticipated.

5.4.4.2 Indirect Impacts

No indirect adverse construction impacts associated with visual resources are anticipated under the Underground Emphasis LRT Alternative.

5.4.4.3 Cumulative Impacts

No cumulative adverse construction impacts associated with visual resources are anticipated under the Underground Emphasis LRT Alternative.

5.4.5 Air Quality

5.4.5.1 Direct Impacts

Regional Construction Emissions

An analysis of anticipated construction-related emissions was completed in accordance with SCAQMD requirements. The estimate included emissions from off-road construction equipment, fugitive dust, construction worker commuting, and haul trucks. Table 5-6 provides a summary of anticipated construction emissions during peak operation for the entire project area.

Daily regional construction emissions are anticipated to exceed SCAQMD regional significance thresholds for VOC, NO_x, CO, and $PM_{2.5}$, and would result in a potential adverse effect without mitigation. Regional construction emissions would be highest during cut and cover or SEM construction activity. The additional excavated soil for the underground segment along 2nd Street would result in an increase in haul truck trips and construction intensity compared to the At-Grade Emphasis LRT Alternative.

Table 5-6. Underground Emphasis LRT Alternative (2014-2017) Maximum Daily Regional Construction Emissions

Daily Emissions (pounds/day)						
Location	VOC	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
2nd/Hope Street station (SEM) + Broadway Station Option						
Onsite	**300**	**2,247**	**1,189**	4	82	**75**
Offsite	8	89	59	<1	19	6
Total	**308**	**2,336**	**1,249**	4	101	**80**
2nd/Hope Street station (Open Cut) + Broadway Station Option						
Onsite	**304**	**2,280**	**1,210**	4	83	**75**
Offsite	9	94	62	11<1	20	6
Total	**313**	**2,375**	**1,272**	4	103	**81**
2nd/Hope Streets station (SEM) + Los Angeles Street Station Option						
Onsite	**300**	**2,247**	**1,189**	4	82	**75**
Offsite	8	85	58	<1	19	5
Total	**308**	**2,332**	**,1,247**	4	101	**80**
2nd/Hope Street station (Open Cut) + Los Angeles Street Station Option						
Onsite	**304**	**2,280**	**1,210**	4	83	**75**
Offsite	8	91	61	<1	19	6
Total	**313**	**2,371**	**1,270**	4	103	**81**
Threshold	75	100	550	150	150	55

*Note: Significant emissions are shown in **bold**.*
Source: CDM, Metro Regional Connector Air Quality Technical Memorandum, 2010.

Localized Construction Emissions

In addition to evaluating emissions on a regional level, construction emissions were also compared to SCAQMD's localized significance thresholds. The maximum localized construction emissions would occur during cut and cover construction of the tunnel on Flower Street, the Flower/6th/5th Street station, the 2nd Street station - Broadway Option or the 2nd Street station - Los Angeles Street Option, and would result in maximum daily localized emissions of approximately 300 ppd of NO_X, 170 ppd of CO, 10 ppd of $PM_{2.5}$ and 11 ppd of PM_{10}. The additional soil removal necessary for the underground segment along 2nd Street would also intensify the localized emissions compared to the At-Grade Emphasis LRT Alternative. Use of electric construction equipment could be encouraged where feasible. Daily construction emissions are anticipated to exceed SCAQMD localized significance thresholds for NO_X, and PM_{10}, and $PM_{2.5}$, and would result in a potential adverse localized air quality construction effect.

5.4.5.2 Indirect Impacts

The Underground Emphasis LRT Alternative construction activities would result in indirect emissions of TACs. Emissions from the project were compared to existing conditions (2009) for CEQA. A summary of project-related emissions are provided in Table 5-7. A summary of the results of the Tier 1 HRA are provided in Table 5-8. Since VOC emissions will decrease in future years because of the improvement in engine technology, the HRA was not conducted for VOC emissions. Instead, it was restricted to inorganic emissions. The Underground Emphasis LRT Alternative would not cause significant construction emissions of TACs under CEQA.

5.4.5.3 Cumulative Impacts

Daily regional and localized construction emissions are anticipated to exceed SCAQMD regional significance thresholds and would result in a potential adverse cumulative effect without mitigation.

5.4.6 Noise and Vibration

5.4.6.1 Direct Impacts

Anticipated construction activities, the construction equipment expected to be used, and the related noise levels are shown in Table 5-9.

Construction of the Underground Emphasis LRT Alternative would generate noise and vibration from excavators, bulldozers, trenchers, drill rigs, tunnel boring machines, cranes, and heavy-duty trucks used to transport construction equipment. According to the City of Los Angeles *2006 CEQA Thresholds Guide*, this type of construction activity would generate a maximum noise level of 90 dBA at 50 feet. The construction activities with the greatest potential to cause noise impacts are: cut and cover excavation on Flower Street, cut and cover construction of the Flower/5th/4th Street station, construction of the cut and cover approach to the 2nd/Hope Street station, construction of the 2nd/Hope Street station, construction of the 2nd

Street station - Broadway Station Option or the 2nd Street Station - Los Angeles Street Option, and construction of the1st and Alameda junction and underpass. These activities would have the greatest potential for noise impacts due to the duration of construction work and proximity to noise sensitive land uses. Without mitigation, adverse effects from construction noise are anticipated.

Table 5-7. Underground Emphasis LRT Alternative (2014-2017) TAC Construction Emissions

TAC	CAS #	Emissions (pounds/hr)			
		2nd/Hope SEM + Broadway Option	2nd/Hope Open Cut + Broadway Option	2nd/Hope SEM + Los Angeles Street Option	2nd/Hope Open Cut + Los Angeles Street Option
Arsenic	7440-38-2	1.83E-05	1.86E-05	1.83E-05	1.86E-05
Chlorine	7782-50-5	1.41E-03	1.46E-03	1.40E-03	1.45E-03
Copper	7440-50-8	9.26E-05	9.44E-05	9.23E-05	9.42E-05
Mercury	7439-97-6	1.02E-04	1.04E-04	1.02E-04	1.03E-04
Nickel	7440-02-0	6.86E-05	6.98E-05	6.85E-05	6.97E-05

Notes:
ASI = application screening index (total PSI)
CAS = Chemical Abstracts Service
lb/hr = pounds per hour
PSI = pollutant screening index (PSL divided by project emissions)
PSL = pollutant screening level (minimum level expected to exceed health risk)
TAC = toxic air contaminant
Source: CDM, Metro Regional Connector Air Quality Technical Memorandum, 2010.

Noise levels for TBM operation are not listed, except for the potential installation and recovery sites, because TBM operation occurs underground and produces little to no noise at the surface. The operations at the potential installation and recovery sites account for the noise listed in Table 5-9. These would be the potential locations where excavated material would be treated and removed. Other construction noise along the TBM segment would be produced haul trucks and equipment needed to perform utility relocations. Noise from these sources

would generate a maximum of 85 dBA at 50 feet and would occur less frequently and for a shorter duration than construction of the At-Grade Emphasis LRT Alternative along 2nd Street.

Table 5-8. Underground Emphasis LRT Alternative (2014-2017) Construction Health Risk Assessment

TAC	CAS #	PSL (pounds/hr)	PSI			
			2nd/Hope SEM + Broadway Option	2nd/Hope Open Cut + Broadway Option	2nd/Hope SEM + Los Angeles Street Option	2nd/Hope Open Cut + Los Angeles Street Option
Arsenic	7440-38-2	1.00E-04	1.83E-01	1.86E-01	1.83E-01	1.86E-01
Chlorine	7782-50-5	1.05E-01	1.35E-02	1.39E-02	1.34E-02	1.38E-02
Copper	7440-50-8	5.00E-02	1.85E-03	1.89E-03	1.85E-03	1.88E-03
Mercury	7439-97-6	9.00E-04	1.14E-01	1.15E-01	1.14E-01	1.15E-01
Nickel	7440-02-0	3.00E-03	2.29E-02	2.33E-02	2.28E-02	2.32E-02
		ASI	3.35E-01	3.35E-01	3.35E-01	3.40E-01
		Threshold	1.0			

Notes:
ASI = application screening index (total PSI)
CAS = Chemical Abstracts Service
lb/hr = pounds per hour
PSI = pollutant screening index (PSL divided by project emissions)
PSL = pollutant screening level (minimum level expected to exceed health risk)
TAC = toxic air contaminant
Source: CDM, Metro Regional Connector Air Quality Technical Memorandum, 2010.

Using the minimum safe distance for Category IV (0.12 inch/sec PPV), the potential worst case vibration category, vibration from construction equipment during utility relocation lane closures would result in a potential adverse effect if it occurred less than 21 feet from buildings. A pre-construction survey of structures within 21 feet of the anticipated zone of construction would be conducted to assess the potential for GBV to cause damage, and to establish baseline pre-construction conditions.

Table 5-9. Construction Activity and Equipment Typical Noise Levels in dBA at 50 feet from Source for the Underground Emphasis LRT Alternative

Activity	Duration (months)	Construction Equipment				
		Concrete Truck	Dozer	Excavator	Crane	Drill Rig
Pre-Construction	4-6	NA	NA	NA	NA	90
Site Preparation	12-18	77	85	82	NA	NA
Flower Street Cut and cover Tunnel	24-48	77	85	82	81	90
Flower/5th/4th Cut and cover Station	24-48	77	85	82	81	90
Cut and cover Approach to 2nd/Hope Street Station	24-48	77	85	82	81	90
2nd/Hope Street Station (SEM)	24-48	77	85	82	81	NA
2nd/Hope Street Open Cut Station	24-48	77	85	82	81	90
2nd Street TBM Tunnel	24-48	77	85	82	81	NA
2nd Street Cut and cover Station (Broadway Option)	24-48	77	85	82	81	NA
2nd Street Cut and cover Station	24-48	77	85	82	81	90
Portal	12-24	77	85	82	81	90
TBM Launch Site	2-4	77	85	82	81	90
1st and Alameda Junction	24-36	77	85	82	81	NA
Operating Systems Installation	TBD	TBD	TBD	TBD	TBD	TBD

Source: CDM, 2010

For the Underground Emphasis LRT Alternative, pre-auguring of the soldier piles at the cut and cover sections would eliminate the need for impact pile driving. Large bulldozers and drill rigs would be the main construction vibration sources, but would operate intermittently and would not be used during every day of construction. LRT construction could begin simultaneously at several locations along the selected route in order to minimize overall construction time. Construction activities in any one location would not last for the entire project construction period.

TBMs perform a slow moving drilling process that produces very little vibration in the surrounding areas. PPVs from tunnel construction in soft ground ranges from 0.0024 to 0.0394 inches per second at a distance of 33 feet from the vibration source. Similar vibration velocities at the same 33 feet distance in the range of 0.0157 to 0.0551 inches per second have also been measured. These PPV vibrations may also be expressed as root mean square (rms) vibration velocity levels ranging from 56 to 83 decibels (VdB) at 33 feet using the same conversion calculation as FTA. The range of vibration generated by TBMs (between 0.0024 to 0.0551 inches per second PPV at a distance of 33 feet) and the distance below grade that tunnel boring would occur (a minimum of 30 feet below ground surface), would yield vibration levels well below the FTA threshold for Category IV buildings of 0.12 inches per second PPV.

TBMs, large bulldozers, and drill rigs would be the main construction vibration sources that could potentially exceed the FTA annoyance criteria for sensitive receptors, as shown in The Noise and Vibration Technical Memorandum, Table 3-2. Perceptible vibration from the construction equipment would be short-term and intermittent, and considered an "infrequent event," less than 30 events per day, as defined by FTA. Sensitive receptors located along the alignment are considered Category 2 and Category 3 land uses under the FTA annoyance criteria. Short-term vibration levels during construction could exceed the FTA annoyance criteria if the identified construction equipment operates within 20 feet of Category 2 land uses or within 16 feet of Category 3 land uses. After incorporating the adjustment of -10 dBA for coupling to building foundation loss (Table 10-1, FTA, 2006), building occupants would not be subject to vibration levels above the FTA annoyance criteria. It should be noted that large bulldozers and drill rigs would operate intermittently and would not be used during every day of construction. Without the implementation of mitigation measures, vibration impacts would be potentially significant.

5.4.6.2 Indirect Impacts

Impacts from construction-related activities are temporary and direct in nature. No indirect impacts are anticipated from noise or vibration under the Underground Emphasis LRT Alternative.

5.4.6.3 Cumulative Impacts

Impacts from noise and vibration during construction would be short term and would not contribute to a cumulative adverse effect. Therefore, no cumulative adverse noise or vibration impacts are anticipated under the Underground Emphasis LRT Alternative.

5.4.7 Geotechnical/Subsurface/Seismic/Hazardous Materials

5.4.7.1 Direct Impacts

Geotechnical/Subsurface/Seismic

The Underground Emphasis LRT Alternative proposed alignment would not cross any known faults. However, portions of the proposed alignment occur in areas mapped with the potential for liquefaction based on soil stability. Areas susceptible to liquefaction are along Flower Street between Wilshire Boulevard and 2nd Street, and along 2nd Street between Hill and San Pedro Streets. A limited portion of the alignment near 1st and Alameda Streets would be within the mapped Inundation Hazard Area. In addition, the proposed 2nd/Hope Street station would be within the Hillside Ordinance area (Bunker Hill).

During construction of underground stations, portal, and the Alameda Street underpass, there would be potential for adverse impacts related to ground settlement and differential settlement on adjacent structures, including historical buildings. Further evaluation and survey would be performed during final design to establish building types, existing conditions, and to develop criteria to limit potential movement to acceptable thresholds. Protection of buildings could involve design of adequately rigid excavation support systems, underpinnings, and ground improvements to minimize settlement to tolerable limits. In addition, a pre-construction survey of the adjacent structures and all historical buildings in the vicinity would be conducted to establish a baseline for measuring potential construction-induced damage. TBMs, cut and cover, and SEM would potentially be used to construct the underground portions of the alignment, and appropriate shoring would be used as needed. TBM operations would not be expected to directly affect building foundations. However, construction monitoring would be utilized during to ensure that movement does not exceed the threshold values. With mitigation, less-than-significant impacts are anticipated.

The laying of surface track work and building of stations and portal structures would likely require removal of protective vegetation and pavement, which would increase the potential for soil erosion. With mitigation, potential adverse construction impacts associated with subsurface soils would be considered less than significant.

Hazardous Materials

Construction of the Underground Emphasis LRT Alternative would entail excavation along most of the proposed alignment, during which contaminated soil and groundwater could be encountered. As described in the Hazardous Materials Technical Memorandum, known and suspected soil and groundwater contamination exists on properties along the proposed

alignment. Lead may be present in surface soils from historical vehicle emissions of older automobiles using leaded gasoline, and PCBs may exist in surface or subsurface soils from leaking transformers. If released during excavation, there would be potential for impacts to human health and the environment from these hazardous materials. Until further study is conducted, the actual levels of hazardous materials that could be encountered in soil and groundwater during construction are unknown. Without mitigation, potential adverse impacts are anticipated.

5.4.7.2 Indirect Impacts

No indirect adverse geotechnical, subsurface, seismic, or hazardous materials impacts are anticipated during construction of the Underground Emphasis LRT Alternative.

5.4.7.3 Cumulative Impacts

No cumulative adverse geotechnical, subsurface, seismic, or hazardous materials impacts are anticipated during construction of the Underground Emphasis LRT Alternative.

5.4.8 Water Quality

5.4.8.1 Direct Impacts

According to the Geotechnical/Subsurface/Seismic/ Hazardous Materials Technical Memorandum, there is known and/or suspected soil and/or groundwater contamination along the proposed alignment. Construction activities have the potential to increase erosion and sedimentation around proposed construction and staging areas. Grading activities associated with construction could potentially result in a temporary increase in the amount of suspended solids running off construction sites. In the case of a storm event, construction site runoff could result in sheet erosion of exposed soil. Groundwater may be encountered during trenching or tunneling which would require dewatering. Dewatering activity would result in the potential release of contaminated water due to the presence of relatively shallow groundwater (located at depths ranging from 14 to 36 feet) that is contaminated with pollutants common to urban development. All dewatering activity would occur with a NDPES permit. Testing would occur prior to construction and on-site treatment and discharge in accordance with applicable standards or transport to a treatment or disposal facility would be required. Without mitigation, potential adverse construction impacts associated with water quality are anticipated under the Underground Emphasis LRT Alternative.

5.4.8.2 Indirect Impacts

No indirect adverse construction impacts associated with water quality are anticipated under the Underground Emphasis LRT Alternative.

5.4.8.3 Cumulative Impacts

No cumulative adverse construction impacts associated with water quality are anticipated under the Underground Emphasis LRT Alternative.

5.4.9 Energy

5.4.9.1 Direct Impacts

The highest indirect energy consumption would occur during site clearance and construction of guideways, structures, stations, and support facilities. Construction of the Underground Emphasis LRT Alternative would consume a one-time amount of approximately 5,000 billion BTUs. LADWP is committed to increasing electricity generation from renewable energy sources and ensuring a reliable flow of electricity to users in its service area. The one-time energy use required to construct this alternative would be offset by the project's long-term, beneficial operational impacts. Given the long-term, beneficial decreases in energy use, potential construction-related impacts would be less than significant.

5.4.9.2 Indirect Impacts

No indirect adverse construction impacts associated with energy are anticipated under the Underground Emphasis LRT Alternative.

5.4.9.3 Cumulative Impacts

No cumulative adverse construction impacts associated with energy are anticipated under the Underground Emphasis LRT Alternative.

5.4.10 Climate Change

5.4.10.1 Direct Impacts

No direct adverse construction impacts associated with climate change are anticipated under the Underground Emphasis LRT Alternative.

5.4.10.2 Indirect Impacts

No indirect adverse construction impacts associated with climate change are anticipated under the Underground Emphasis LRT Alternative.

5.4.10.3 Cumulative Impacts

The construction of the Underground Emphasis LRT Alternative would result in GHG emissions from diesel-fueled construction equipment. Emissions would be produced by onsite equipment, offsite worker vehicles, and offsite haul trucks. A total of approximately 100,600 metric tons per year of GHG emissions would be produced during all phases of construction under the Underground Emphasis LRT Alternative (see the Climate Change Technical Memorandum for more details).

The proposed project would result in a decrease in GHG emissions compared to the No Build Alternative and, due to regional growth unrelated to the project, an increase in GHG emissions compared to existing conditions (2009). The Underground Emphasis LRT Alternative is consistent with CARB's Scoping Plan requirement to reduce GHG emissions. It is expected that other projects operating in 2035 would be consistent with the emission reduction targets of SB 375 and the Regional Transportation Plan. As a result, potential emissions would not be cumulatively significant.

5.4.11 Historic, Archaeological, and Paleontological Resources

5.4.11.1 Direct Impacts

Historic Resources

Potential effects, but no adverse effects, would result from dirt from construction activities, changes in access during construction, visual changes during construction, demolition and takes, construction of underground stations, installation of catenary poles and TPSS. The effects would be short-term and would not alter characteristics of historic properties in a manner that would diminish the integrity of the properties' location, design, setting, materials, workmanship, feeling, or association.

The proposed train portal at the intersection of Alameda and 1st Street would be within the viewshed of two historic properties, the Little Tokyo National Historic Landmark Historic District and the NRHP eligible John A. Roebling Sons Co. Building (APE Map #7-35). However, the portal area is not encompassed within the boundary of a historic property, historical resource, or a contributing element to the significance of either property. An asphalt paved parking lot currently occupies the majority of the parcel. No adverse effect would occur to the Little Tokyo National Historic Landmark District or the John A. Roebling Sons Co Building from the construction of the portal.

Several NRHP and/or CRHR eligible properties could be potentially affected by cut and cover construction, differential settlement, and construction noise and vibration associated with construction of the Underground Emphasis LRT Alternative. The implementation of design measures would protect and stabilize the ground near historic properties as noted in MM-BE-2, MM-BE-3, and MM-BE-5. These measures would avoid adverse effects to all properties. If properly implemented, short term construction activities would not directly alter a characteristic of the historic property in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

Archaeological Resources

The Underground Emphasis LRT Alternative involves substantial ground disturbance, and therefore has the potential to alter, remove, or destroy archaeological resources within the APE. It has the potential to affect archaeological resources during ground disturbance from constructing a new underground tunnel along its entire route; underground stations on 2nd

Street (either at Broadway or at Los Angeles Street), 2nd/Hope Street, and Flower/5th/4th Streets; an automobile underpass on Alameda Street between 2nd and Temple Streets; and a potential pedestrian bridge at the intersection of Alameda and 1st Streets.

Potentially affected resources include site CA-LAN-3588 and the Los Angeles zanja system (specifically Zanjas 3, 4, 5, and 8; see Figure 4-1). Although the precise location and local integrity of the zanjas have not been established, the project's 2nd Street alignment likely crosses the system multiple times.

Archaeological remains associated with these sites may extend into the project area and be subject to direct alteration. This would result in a significant effect that could be mitigated. Construction of new stations would almost certainly affect any extant archaeological resources within their footprints. Construction of new tunnel segments through deep tunneling, as opposed to cut-and-cover techniques, could avoid effects to shallow archaeological resources, although the maximum depth of these resources and minimum depth of construction would both need to be established prior to reaching this conclusion. Implementing MM-A-1 and MM-A-2 would reduce this effect to a less-than-significant level.

Paleontological Resources

The Underground Emphasis LRT Alternative involves ground disturbance and therefore has the potential to adversely impact paleontological resources within the project area. This disturbance would result from excavations related to construction of a new underground tunnel along most of the alignment; new underground stations at Flower/5th/4th Street, 2nd/Hope Street, 2nd Street station (either at Broadway or at Los Angeles Street); an automobile underpass on Alameda Street between 2nd Street and Temple Street; and a proposed pedestrian bridge at the intersection of Alameda and 1st Streets. Any ground disturbances in areas of high sensitivity (See Figure 4-3) will have the potential to impact paleontological resources at the surface and at depth; areas of ground disturbance in areas of sensitivity ranging from low to high have the potential to impact paleontological resources at a depth of 5 feet or more below the ground surface. In areas where proper mitigation measures (Section 6.1) can be implemented, potential impacts can be reduced to a less than significant level. In areas where new underground TBM segments would be constructed, mitigation for paleontological resources will not be feasible and are thus unavoidable.

5.4.11.2 Indirect Impacts

The construction of the Underground Emphasis LRT Alternative would have the potential to indirectly impact historical resources during cut and cover construction, underpass construction at Alameda and 1st Streets, portal construction, and TBM tunneling. The impacts would be indirect because the construction activities themselves would not damage

historical properties, but vibration and possible subsidence of soils could impact the historical integrity of buildings. Mitigation would minimize the potential adverse impacts.

5.4.11.3 Cumulative Impacts

No cumulative adverse construction impacts associated with historical, archaeological, and paleontological resources are anticipated under the Underground Emphasis LRT Alternative.

5.4.12 Ecosystems and Biological Resources

5.4.12.1 Direct Impacts

During construction of the Underground Emphasis LRT Alternative, some mature trees containing nesting could be removed. As these mature trees may provide potential nesting and roosting habitat for bird species, including raptors, removal or disturbance of this vegetation during the nesting season could directly impact the habitat and any bird species that are present. There are currently 170 mature trees in the area that could potentially be affected by construction, and some of these trees could be removed or disturbed during construction. It is unknown at this time exactly how many trees could be affected. An estimated 40 native California sycamore trees are located in the potential area of impact and could be affected by this alternative. As project design progresses it may be possible to minimize the number of sycamores affected by avoidance or fencing. The details of these impacts and mitigation measures are presented in the Ecosystems/Biological Resources Technical Memorandum. Potential mitigation measures are described in Section 6 and include compliance with the Native Tree Protection Ordinance. Compliance with the Native Tree Protection Ordinance, including replacement of this protected species at a 2:1 ratio, would reduce this potential impact to a less than significant level.

5.4.12.2 Indirect Impacts

Direct impacts to birds and their habitat by removing or disturbing mature trees have the potential to cause indirect impacts elsewhere. If birds are forced to relocate to new areas during the nesting season, increased competition for food and nesting habitat would be a potential indirect impact.

However, because the downtown area provides only low quality habitat for migratory birds, these potential impacts are not considered to be significant because only a small number of birds (if any) could be displaced. Further, mitigation taken to comply with the MBTA and the California Fish and Game Code would reduce potential indirect impacts to a less-than-significant level.

5.4.12.3 Cumulative Impacts

No cumulative adverse construction impacts associated with ecosystems or biological resources are anticipated under the Underground Emphasis LRT Alternative.

5.4.13 Parklands and Other Community Facilities

5.4.13.1 Direct Impacts

A large portion of the alignment of the Underground Emphasis LRT Alternative would be constructed underground using TBMs, so access restrictions on 2nd Street would be limited to staging areas. However, where there would be cut and cover, temporary road closures would be needed. Access to the parking structure beneath Maguire Gardens and pedestrian access to the gardens would be temporarily restricted. Locations along the alignment that could experience modified pedestrian and vehicle access during construction include the new LAPD headquarters, Caltrans, the Little Tokyo Branch Public Library, MOCA, Go For Broke Monument, and JANM. Response times for emergency services could also be impacted, but less than the At-Grade Emphasis LRT Alternative on 2nd Street. Without mitigation, potential adverse construction impacts associated with parklands and other community facilities are anticipated under the Underground Emphasis LRT Alternative.

5.4.13.2 Indirect Impacts

Although construction impacts are direct by nature, the construction of the Underground Emphasis LRT Alternative alignment could potentially discourage patrons of community facilities and parks due to restricted access and temporary parking restrictions. Mitigation could include signs, detour routes, and temporary replacement parking to encourage pedestrian and vehicular access to these community facilities. Without mitigation, potential adverse impacts are anticipated.

5.4.13.3 Cumulative Impacts

No cumulative adverse construction impacts associated with parklands or other community facilities are anticipated under the Underground Emphasis LRT Alternative.

5.4.14 Economic Vitality and Employment Opportunities

5.4.14.1 Direct Impacts

The construction of the Underground Emphasis LRT Alternative would result in fewer adverse economic impacts in the project area than the At-Grade Emphasis LRT Alternative. Depending on the construction techniques used, there would be a need for phased street closure, but the economic effects would be less pronounced than at-grade track construction. The potential economic impacts caused by the Underground Emphasis LRT Alternative would be primarily limited to the station sites, portal location and underpass location.

Temporary closures or restricted access to Alameda and 1st Streets during construction of the underpass and pedestrian bridge would impact a heavily utilized truck route and also restrict freeway access to Little Tokyo. Cultural institutions, such as MOCA and JANM, and businesses could potentially be impacted directly.

Investment in transportation, including direct investment in the form of capital construction and operations costs, would provide economic benefits through the creation of direct and indirect jobs and spending by suppliers whose goods and services are used for the project. These benefits are discussed further in the Economic and Fiscal Impacts Technical Memorandum. The benefits of the additional transit infrastructure in the long-term would outweigh the temporary significant impacts in the project area.

5.4.14.2 Indirect Impacts

As discussed in Section 5.4.3, construction of the Underground Emphasis LRT Alternative would result in the temporary closure of several streets throughout the project area. During utility relocation and lane closures, traffic would be diverted to surrounding streets. The traffic diversions and parking restrictions could potentially impact the economic viability of businesses adjacent to the closures, though to a lesser extent than the At-Grade Emphasis LRT Alternative. Although these construction impacts would be short-term and intermittent, they would be considered potentially adverse without mitigation.

5.4.14.3 Cumulative Impacts

No cumulative adverse construction impacts associated with economic vitality are anticipated under the Underground Emphasis LRT Alternative.

5.4.15 Safety and Security

5.4.15.1 Direct Impacts

The contractor will have a safety plan and be responsible for construction site security in conformance with local regulations and standards. Construction activities are not anticipated to affect security in the project area. Construction and staging areas would typically be fenced off and well lit. A large portion of the construction would occur underground, separated from pedestrians and vehicles. No direct adverse impacts associated with safety and security are anticipated.

5.4.15.2 Indirect Impacts

No indirect adverse construction impacts associated with safety and security are anticipated under the Underground Emphasis LRT Alternative.

5.4.15.3 Cumulative Impacts

No cumulative adverse construction impacts associated with safety and security are anticipated under the Underground Emphasis LRT Alternative.

5.5 Fully Underground LRT Alternative – Little Tokyo Variation 1

The Fully Underground LRT Alternative – Little Tokyo Variation 1 would extend from the 7th Street/Metro Center Station northward in a cut and cover tunnel below Flower Street with a

new underground station north of 5th Street. At 3rd Street, the underground tunnel would extend east with a new underground station near 2nd and Hope Streets to provide access to Bunker Hill. The station would be constructed using either the open cut method or SEM. From there, a tunnel excavated by TBM would continue east beneath 2nd Street. A third underground station would be located between Broadway and Spring Street. The tunnel would continue along 2nd Street under Little Tokyo to Central Avenue. Until this point, the alignment would be the same as the Underground Emphasis LRT Alternative – Broadway Station Option. A fourth underground station would be constructed using the cut and cover method at the block bounded by Central Avenue and 1st, 2nd, and Alameda Streets. This station would replace the existing Little Tokyo/Arts District at-grade station. The alignment would emerge to at-grade connections with the existing Gold Line tracks via two portals: one northeast of Temple and Alameda Streets for the North-South Line, and one on 1st Street east of Alameda Street for the East-West Line.

The analysis of the potential impacts that these construction activities could have are discussed for all environmental topic areas except for Land Use and Growth-Inducing Impacts because construction activities do not tend to have impacts in these topic areas.

5.5.1 Traffic and Parking

5.5.1.1 Direct Impacts

Permanent Impacts From Construction

Construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1, would result in the permanent loss of approximately seven on-street parking spaces. The details of these impacts and mitigation measures are presented in the Transportation Impacts Technical Memorandum. Additional parking spaces that would be temporary lost during construction activities are described below.

Construction-Related Impacts

For this build alternative, temporary lane changes due to construction activities would be the same as the Underground Emphasis LRT Alternative west of Central Avenue. This would result in the temporary reduction of roadway capacity and potential modification of existing traffic patterns to bypass construction activities. The construction of the proposed Alameda Street portal north of Temple Street would result in the reduction of roadway capacity for extended time periods during construction. Two through travel lanes would be maintained in each direction along Alameda Street from Temple Street northwards, tapering back to three through lanes in each direction near Aliso Street. As a result of this configuration, the two-way left turn median in the mid-block area and the exclusive right and left turn lanes at the southbound intersection approach at Temple Street would be temporarily eliminated over the period needed to construct the portal. The southbound intersection lane configuration at Temple Street would consist of a shared through and right turn lane and a shared through and left turn lane. The existing signal phasing may be changed to split phasing to minimize

conflicts between southbound left turns and the opposing northbound through movements. This would help prevent the formation of queues behind vehicles waiting for a gap in opposing traffic to complete left turn movements. Consequently, travel times for vehicles along this segment of Alameda Street would be expected to increase due to the potential for additional congestion and changed operating conditions at the intersection of Temple and Alameda Streets.

On 1st Street between Alameda and Vignes Streets, one through travel lane in each direction would need to be removed temporarily during construction. This could cause additional congestion. However, the 1st Street bridge is currently operating one-way eastbound with only two lanes, and lengthy delays do not frequently occur.

Parking impacts due to construction activities would be the same as the Underground Emphasis LRT Alternative west of Central Avenue (unless the entire block is required for construction, in which case, additional off-street parking would be lost; see the Transportation Technical Memorandum for more details). The construction of the proposed Alameda Street portal north of Temple Street would result in the displacement of loading areas for extended time periods during construction.

Construction activities and impacts to pedestrian and bicycle flow for this alternative would be the same as the Underground Emphasis LRT Alternative west of Central Avenue. The construction of the proposed Alameda Street portal north of Temple Street would result in the reduction of roadway capacity for extended time periods during construction activities and the elimination of the sidewalk on the east side of Alameda Street. Roadway capacity would also be temporarily reduced on 1st Street between Alameda and Vignes Streets. These capacity reductions could potentially impact both pedestrian and bicycle flow.

The operational phase of the Fully Underground LRT Alternative – Little Tokyo Variation 1 would result in the restoration of the travel lanes and parking, pedestrian, and bicycle facilities to their permanent configurations. Potential short term, adverse impacts are anticipated during construction of this alternative.

5.5.1.2 Indirect Impacts

Impacts from construction-related activities would be temporary and direct in nature. No indirect impacts are anticipated from traffic circulation or parking under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.1.3 Cumulative Impacts

Impacts to traffic circulation during construction would be short term, but would contribute to a potential cumulative adverse effect when added to other projects in the downtown area. Potential cumulative adverse traffic circulation impacts are anticipated under the Fully Underground LRT Alternative - Little Tokyo Variation 1.

5.5.2 Displacements and Relocation

5.5.2.1 Direct Impacts

Permanent Impacts During Construction Period

Compared to the Underground Emphasis LRT Alternative, up to five additional full takes, one fewer partial take, and two additional permanent underground easements would be required to construct the Fully Underground LRT Alternative – Little Tokyo Variation 1. These properties would be utilized for construction staging, below grade tunneling, and station construction. The details of these impacts and mitigation measures are presented in the Displacements and Relocation of Existing Uses Technical Memorandum.

Construction-Related Impacts

During construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1, staging of equipment and materials would require temporary construction easements that would impact three fewer parcels than the Underground Emphasis LRT Alternative (five parcels in total). The portions of these parcels that would be utilized would be plazas and open areas. Access to businesses and existing buildings would be maintained. Sidewalks and detour routes would also be configured as needed. Mitigation would minimize the potential adverse impacts associated with this type of displacement during construction. In addition, once construction is completed, the sites would be restored to their permanent configurations.

5.5.2.2 Indirect Impacts

Displacement impacts are direct in nature. Therefore, no indirect construction impacts associated with displacement are anticipated.

5.5.2.3 Cumulative Impacts

No cumulative adverse construction impacts associated with displacements or relocation are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.3 Community and Neighborhoods

5.5.3.1 Direct Impacts

Similar to the Underground Emphasis LRT Alternative, mobility would be reduced in the Financial District, Bunker Hill, Civic Center, Historic Core \ and Little Tokyo areas due to street closures associated with construction activities including track installation, cut and cover excavation, TBM deployment, and structural support work for the Fully Underground LRT Alternative – Little Tokyo Variation 1. Disruption of traffic patterns would restrict, but not eliminate, access to residences and businesses, though to a lesser extent than the At-Grade Emphasis LRT Alternative and the Underground Emphasis LRT Alternative. In Little Tokyo, there would be less disruption to traffic along Alameda and 1st Streets than the Underground Emphasis LRT Alternative because this alternative does not include the excavation and

construction of the Alameda Street underpass or construction of the potential pedestrian bridge across Alameda Street. However, the cut and cover construction of the rail junction beneath the intersection of 1st and Alameda Streets could still cause disruption. The installation of TBMs either at Little Tokyo or Bunker Hill could pose temporary disruptions for businesses and residents, particularly Savoy and Honda Plaza in Little Tokyo and the Bunker Hill Towers. Without mitigation, potential adverse construction impacts associated with community and neighborhoods are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.3.2 Indirect Impacts

During utility relocation, mobility would be reduced in the Civic Center, the Historic Core, and Little Tokyo areas. Disruption of traffic patterns would access for residents and businesses, though to a lesser extent than the At-Grade Emphasis LRT Alternative and the Underground Emphasis LRT Alternative. This could impact the economic vitality of some businesses, particularly in Little Tokyo, where the community has expressed concern about construction activities. Prolonged disruption to businesses could affect the cohesion of some communities, including Little Tokyo. Without mitigation, potential adverse indirect construction impacts associated with community and neighborhoods are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.3.3 Cumulative Impacts

No cumulative adverse construction impacts associated with communities or neighborhoods are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.4 Visual Resources and Aesthetics

5.5.4.1 Direct Impacts

Views and Visual Character

During construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1, the same construction staging as the Underground Emphasis LRT Alternative would be used. Impacts associated with views and visual character would be similar to the Underground Emphasis LRT Alternative.

Lighting

Most of the construction would be conducted beneath the surface. In some locations along the surface, temporary lighting may be necessary for nighttime construction, which is typically scheduled in order to minimize disruption to daytime traffic and for nighttime lighting for staging sites, primarily for security. However, nighttime construction activities would be limited to non-residential areas and nighttime illumination of staging areas would be directed towards the site and away from sensitive uses. Therefore, less-than-significant impacts are anticipated.

5.5.4.2 Indirect Impacts

No indirect adverse construction impacts associated with visual resources are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.4.3 Cumulative Impacts

No cumulative adverse construction impacts associated with visual resources are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1

5.5.5 Air Quality

5.5.5.1 Direct Impacts

Regional Construction Emissions

Additional excavation needed for the underground station at 2nd Street and Central Avenue as well as the underground junction beneath Alameda and 1st Streets would cause the Fully Underground LRT Alternative – Little Tokyo Variation 1 to have greater construction emissions than the Underground Emphasis LRT Alternative. Additional truck trips to dispose of excavated material would also be needed. This would result in an increase in NO_x and diesel particulate matter emissions. An analysis of construction-related emissions was completed in accordance with SCAQMD requirements. The estimate included emissions from off-road construction equipment, fugitive dust, construction worker commuting, and haul trucks. Table 5-10 provides a summary of anticipated construction emissions during the peak of construction for the entire project area.

Table 5-10. Fully Underground LRT Alternative – Little Tokyo Variation 1 (2014-2017) Maximum Daily Regional Construction Emissions

Daily Emissions (pounds/day)						
Location	VOC	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
2nd/Hope Street station (SEM)						
Onsite	**367**	**2,596**	**1,474**	5	105	**95**
Offsite	10	104	69	<1	24	7
Total	**377**	**2,699**	**1,542**	5	129	**102**
2nd/Hope Street station (Open Cut)						
Onsite	**376**	**2,670**	**1,523**	5	108	**98**

Table 5-10. Fully Underground LRT Alternative – Little Tokyo Variation 1 (2014-2017) Maximum Daily Regional Construction Emissions

Daily Emissions (pounds/day)						
Location	VOC	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
Offsite	10	107	71	<1	24	7
Total	**386**	**2,777**	**1,593**	5	133	**105**
Threshold	75	100	550	150	150	55

*Note: Significant emissions are shown in **bold.***
Source: CDM, Metro Regional Connector Air Quality Technical Memorandum, 2010.

Use of electric construction equipment could be encouraged where feasible. Daily regional construction emissions are anticipated to exceed SCAQMD regional significance thresholds for VOC, NO_x, CO, and $PM_{2.5}$ and would result in a potential adverse effect without mitigation.

Localized Construction Emissions

In addition to evaluating emissions on a regional level, construction emissions were also compared to SCAQMD's localized significance thresholds. The maximum localized construction emissions would occur during cut and cover construction of the tunnel along Flower Street, cut and cover construction of the Flower/5th/4th Street station, and cut and cover construction of the 2nd Street/Broadway station. The maximum daily localized emissions would be approximately 300 ppd of NO_x, 170 ppd of CO, 11 ppd of $PM_{2.5}$ and 13 ppd of PM_{10}. Daily construction emissions are anticipated to exceed SCAQMD localized significance thresholds for NO_x, and PM_{10}, and $PM_{2.5}$ and would result in a potential adverse localized air quality construction effect.

5.5.5.2 Indirect Impacts

Construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1 would result in indirect emissions of TACs. Emissions from the project were compared to existing conditions (2009) for CEQA. A summary of the results of the Tier 1 HRA are provided in Table 5-11. Since VOC emissions will decrease in future years because of the improvement in engine technology, the HRA was not conducted for VOC emissions. Instead, it was restricted to inorganic emissions. The Fully Underground LRT Alternative – Little Tokyo Variation 1 would not generate significant construction emissions of TACs under CEQA.

5.5.5.3 Cumulative Impacts

Daily regional and localized construction emissions are anticipated to exceed SCAQMD regional significance thresholds and would result in a potential adverse cumulative effect without mitigation.

5.5.6 Noise and Vibration

5.5.6.1 Direct Impacts

The anticipated construction activities and equipment and the related noise levels for the Fully Underground LRT Alternative – Little Tokyo Variation 1 would be the same as shown in Table 5-9 for the Underground Emphasis LRT Alternative.

The construction of the underground alignment along Alameda and 1st Streets would result in additional areas of noise and vibration beyond those identified for the Underground Emphasis LRT Alternative. Additional exposure to sensitive receptors adjacent to these areas is expected. Construction activities would result in the same levels of noise and vibration described under the Underground Emphasis LRT Alternative. The closer proximity of these activities to sensitive receptors along Alameda and 1st Streets would intensify the level of impacts compared to the Underground Emphasis LRT Alternative.

The construction activities with the greatest potential to cause noise impacts would be: cut and cover construction along Flower Street, cut and cover construction of the Flower/5th/4th Street station, cut and cover construction of the approach to the 2nd/Hope Street station, construction of the 2nd/Hope Street station, cut and cover construction of the 2nd Street /Broadway station, and open cut construction of the 2nd Street/Central Avenue station. These activities would have the greatest potential for noise impacts due to the duration of the proposed work and proximity to noise sensitive land uses.

Table 5-11. Fully Underground LRT Alternative – Little Tokyo Variation 1 (2014-2017) Toxic Air Contaminant Construction Emissions and HRA

TAC	CAS #	Emissions (pounds/hr)		PSL	PSI	
		2nd/Hope Station SEM	2nd/Hope Station Open Cut	(lb/hr)	2nd/Hope Station SEM	2nd/Hope Station Open Cut
Arsenic	7440-38-2	2.35E-05	2.43E-05	1.00E-04	2.35E-01	2.43E-01
Chlorine	7782-50-5	1.82E-03	1.90E-03	1.05E-01	1.74E-02	1.81E-02
Copper	7440-50-8	1.19E-04	1.23E-04	5.00E-02	2.38E-03	2.46E-03
Mercury	7439-97-6	1.31E-04	1.35E-04	9.00E-04	1.46E-01	1.50E-01
Nickel	7440-02-0	8.80E-05	9.11E-05	3.00E-03	2.93E-02	3.04E-02
				ASI	4.29E-01	4.44E-01
				Threshold	1.0	

Notes:
ASI = application screening index (total PSI)
CAS = Chemical Abstracts Service
lb/hr = pounds per hour
PSI = pollutant screening index (PSL divided by project emissions)
PSL = pollutant screening level (minimum level expected to exceed health risk)
TAC = toxic air contaminant
Source: CDM, Metro Regional Connector Air Quality Technical Memorandum, 2010.

Under the Fully Underground LRT Alternative – Little Tokyo Variation 1, the at-grade junction and underpass on Alameda Street would not be constructed. This would remove a noise source in the Little Tokyo community that would last for a two to three year period under the At-Grade and Underground Emphasis LRT Alternatives. However, noise would still be generated by construction of the underground junction beneath 1st and Alameda Streets and the new portals on 1st Street and near Temple and Alameda Streets. Adverse effects from construction noise would still be expected without the implementation of mitigation measures.

The potential for construction vibration to cause building damage and annoyance impacts would be the same as identified for the Underground Emphasis LRT Alternative. Without the implementation of mitigation measures, vibration impacts would be potentially significant under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.6.2 Indirect Impacts

Impacts from construction-related activities are temporary and direct in nature. No indirect impacts are anticipated from noise or vibration under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.6.3 Cumulative Impacts

Impacts from noise and vibration during construction would be short term and would not contribute to a cumulative adverse effect. Therefore, no cumulative adverse noise or vibration impacts are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.7 Geotechnical/Subsurface/Seismic/Hazardous Materials

5.5.7.1 Direct Impacts

Geotechnical/Subsurface/Seismic

The proposed Fully Underground LRT Alternative – Little Tokyo Variation 1 alignment would not cross any known faults. However, portions of the proposed alignment occur in areas mapped with the potential for liquefaction based on soil stability. Areas susceptible to liquefaction are on Flower Street between Wilshire Boulevard and 2nd Street, and along 2nd Street between Hill and San Pedro Streets. The portion of the alignment near the intersection of 1st and Alameda Streets would be within the mapped Inundation Hazard Area. In addition, the proposed 2nd/Hope Street station would be within the Hillside Ordinance area (Bunker Hill).

Geotechnical, subsurface, and seismic impacts during construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1 would be similar to those of the Underground Emphasis LRT Alternative during construction. Section 5.4.7.1 contains further analysis.

Hazardous Materials

Construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1 would entail excavation along most of the proposed alignment, during which contaminated soil and groundwater could be encountered. Hazardous material impacts during construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1 would be similar to those of the Underground Emphasis LRT Alternative during construction. Section 5.4.7.1 contains further analysis.

5.5.7.2 Indirect Impacts

No indirect adverse geotechnical, subsurface, seismic, or hazardous materials impacts are anticipated during construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.7.3 Cumulative Impacts

No cumulative adverse geotechnical, subsurface, seismic, or hazardous materials impacts are anticipated during construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.8 Water Quality

5.5.8.1 Direct Impacts

Water quality impacts during construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1 would be similar to those of the Underground Emphasis LRT Alternative during construction. Section 5.4.8.1 contains further analysis.

5.5.8.2 Indirect Impacts

No indirect adverse construction impacts associated with water quality are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.8.3 Cumulative Impacts

No cumulative adverse construction impacts associated with water quality are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.9 Energy

5.5.9.1 Direct Impacts

The highest indirect energy consumption would occur during site clearance and construction of guideways, stations, and support facilities. Construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1 would result in a temporary energy demand of approximately 6,000 billion BTUs. This impact would be temporary, and the project would result in long-term, beneficial decreases in energy use in the region. LADWP is committed to increasing electricity generation from renewable energy sources and ensuring a reliable flow of electricity to users in its service area. Given the long-term, beneficial decreases in energy use associated with this alternative; potential construction-related impacts would be less than significant.

5.5.9.2 Indirect Impacts

No indirect adverse construction impacts associated with energy are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.9.3 Cumulative Impacts

No cumulative adverse construction impacts associated with energy are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.10 Climate Change

5.5.10.1 Direct Impacts

No direct adverse construction impacts associated with climate change are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.10.2 Indirect Impacts

No indirect adverse construction impacts associated with climate change are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.10.3 Cumulative Impacts

The construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1 would result in GHG emissions from diesel-fueled construction equipment. Emissions would be generated by onsite equipment, offsite worker vehicles, and offsite haul trucks. An approximate total of 118,300 metric tons per year of GHG emissions would be produced during all phases of construction for the Fully Underground LRT Alternative – Little Tokyo Variation 1.

The proposed alternative would result in a decrease in GHG emissions compared to the No Build Alternative and, due to regional growth unrelated to the project, an increase in GHG emissions compared to existing conditions (2009). The Fully Underground Alternative – Little Tokyo Variation 1 is consistent with CARB's Scoping Plan requirement to reduce GHG emissions. It is expected that other projects operating in 2035 would be consistent with the emission reduction targets of SB 375 and the Regional Transportation Plan. As a result, emissions would not be cumulatively significant.

5.5.11Historic, Archaeological, and Paleontological Resources

5.5.11.1 Direct Impacts

The Fully Underground LRT Alternative – Little Tokyo Variation 1 would have the potential to alter, remove, or destroy archaeological and paleontological resources within the APE due to the creation of a new underground tunnel along its entire route and four new underground stations. Potential archaeological and paleontological impacts during construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1 would be similar to those of the Underground Emphasis LRT Alternative. Section 5.4.11.1 contains further analysis.

5.5.11.2 Indirect Impacts

The construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1 would have the potential to indirectly impact historical resources during cut and cover tunnel and station construction, portal construction, and TBM tunneling. The potential impacts would be indirect because the construction activities themselves would not damage historical

properties, but vibration and possible subsidence of soils could impact their historical integrity. Mitigation would minimize the potential adverse impacts.

5.5.11.3 Cumulative Impacts

No cumulative adverse construction impacts associated with historical, archaeological, or paleontological resources are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.12 Ecosystems and Biological Resources

5.5.12.1 Direct Impacts

During construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1, some mature trees containing nesting located along the proposed alignment could be removed, though less than the Underground Emphasis LRT Alternative. As these mature trees may provide potential nesting and roosting habitat for bird species, including raptors, removal or disturbance of this vegetation during the nesting season could directly impact the habitat and any bird species that are present. As no mature trees or other biological resources were observed in the area north and east of 1st and Alameda Streets, there are no additional direct impacts related to the Fully Underground LRT Alternative – Little Tokyo Variation 1. The same mitigation measures described in Section 6 would be required to reduce these potential impacts to a less-than-significant level.

5.5.12.2 Indirect Impacts

As with the other build alternatives, indirect impacts to migratory birds from the Fully Underground LRT Alternative- Little Tokyo Variation 1 would not be significant because the project area provides only low quality habitat for a small number of migratory birds and only a small number of birds (if any) could be displaced. Mitigation taken to comply with the MBTA and the California Fish and Game Code would reduce these potential indirect impacts to a less-than-significant level.

5.5.12.3 Cumulative Impacts

No cumulative adverse construction impacts associated with ecosystems or biological resources are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.13 Parklands and Other Community Facilities

5.5.13.1 Direct Impacts

A large portion of the alignment of the Fully Underground LRT Alternative – Little Tokyo Variation 1 would be constructed underground using TBM tunneling and cut-and-cover construction, so access restrictions on 2nd Street would be limited to staging areas. However,

temporary road closures would be needed in the vicinity of cut and cover construction activities. Access to the parking structure beneath Maguire Gardens and pedestrian access to the gardens would be temporarily restricted, but not removed, as in the Underground Emphasis LRT Alternative. Locations along the alignment that could experience modified pedestrian and vehicle access during construction and operation include the new LAPD headquarters, Caltrans, and the Little Tokyo Branch Public Library. Other community resources, particularly in Little Tokyo (MOCA, Go For Broke Monument, and JANM), would experience fewer impacts associated with restricted access because the Fully Underground LRT Alternative – Little Tokyo Variation 1 does not include surface track work, an underpass, or a pedestrian bridge at the intersection of Alameda and 1st Streets. Instead, an underground junction would be built at this location using the cut and cover method, along with portals near Temple and Alameda Streets and on 1st Street east of Alameda Street. Response times for emergency services could also be impacted, but to a lesser extent than the At-Grade Emphasis LRT Alternative. Without mitigation, potential adverse construction impacts associated with parklands and other community facilities are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.13.2 Indirect Impacts

Although construction impacts are direct by nature, the construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1 alignment could potentially discourage patrons of community facilities and parks due to restricted access and temporary parking restrictions. Mitigation could include signs, detour routes, and temporary replacement parking to encourage pedestrian and vehicular access to these community facilities. Without mitigation, potential adverse impacts are anticipated.

5.5.13.3 Cumulative Impacts

No cumulative adverse construction impacts associated with parklands or community facilities are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.14 Economic Vitality and Employment Opportunities

5.5.14.1 Direct Impacts

The construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1 would result in fewer adverse economic impacts in the project area than identified under the Underground Emphasis LRT Alternative. Depending on the construction techniques used, there may be a need for phased street closure. However, the economic effects of the closures would not be as severe as the Underground Emphasis LRT Alternative due to lack of elements such as construction of an at-grade junction in the intersection of 1st and Alameda Streets and an Alameda Street underpass and pedestrian bridge. Other elements such as the underground junction beneath 1st and Alameda Streets and the new portals at Temple and Alameda Streets and on 1st Street east of Alameda Street would also cause disruption. The

potential temporary economic impacts caused by construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1 would be primarily limited to the station sites, and would be similar to the Underground Emphasis LRT Alternative.

Investment in transportation, including direct investment in the form of capital construction and operations costs, provides economic benefits through the creation of direct and indirect jobs, and investment and spending by suppliers whose goods and services are used in the project. These benefits are discussed in the Economic and Fiscal Impacts Technical Memorandum. The benefits of the additional transit infrastructure in the long-term would outweigh the temporary significant impacts in the project area.

5.5.14.2 Indirect Impacts

As discussed in the Section 5.5.3, construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1 would result in the temporary closure of several streets. During utility relocation and lane closures, traffic would be diverted to surrounding streets. The traffic diversions and restricted parking could potentially impact the economic viability of businesses adjacent to the closures, though to a lesser degree than the At-Grade Emphasis LRT Alternative. Although these potential construction impacts would be short-term and intermittent, they would be considered potentially adverse without mitigation.

5.5.14.3 Cumulative Impacts

No cumulative adverse construction impacts associated with economic vitality are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.15 Safety and Security

5.5.15.1 Direct Impacts

The contractor will have a safety plan and be responsible for construction site security in conformance with local regulations and standards. Construction activities are not anticipated to affect security in the project area. Construction staging areas are typically fenced off and well lit. A large portion of the construction would occur underground, separated from pedestrians and vehicles. No direct adverse impacts associated with safety or security are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.15.2 Indirect Impacts

No indirect adverse construction impacts associated with safety or security are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.5.15.3 Cumulative Impacts

No cumulative adverse construction impacts associated with safety or security are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 1.

5.6 Fully Underground LRT Alternative – Little Tokyo Variation 2

The Fully Underground LRT Alternative – Little Tokyo Variation 2 would extend from the 7th Street/Metro Center Station northward in a cut and cover tunnel below Flower Street with a new underground station north of 5th Street. At 3rd Street, the underground tunnel would extend east with a new underground station near 2nd and Hope Streets to provide access to Bunker Hill. This station could be constructed using either the open cut method or SEM. From there, a tunnel excavated by TBM would continue east beneath 2nd Street. A second underground station would be located between Broadway and Spring Street. The tunnel would continue along 2nd Street under Little Tokyo to Central Avenue. Until this point, the alignment would be the same as the Underground Emphasis LRT Alternative – Broadway Station Option. An underground two-level station would be located in the block bounded by Central Avenue and 1st, 2nd, and Alameda Streets. This station would replace the existing Little Tokyo/Arts District at-grade station. The alignment would emerge to at-grade connections with the existing Gold Line tracks via three portals: northeast of Temple and Alameda Streets for the North-South Line, and two staggered portals on 1st Street east of Alameda Street for the East-West Line.

The analysis of the potential impacts that these construction activities could have are discussed for all environmental topic areas except for Land Use and Growth-Inducing Impacts because construction activities do not tend to have impacts in these topic areas.

5.6.1 Traffic and Parking

5.6.1.1 Direct Impacts

Permanent Impacts During Construction

Construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2, would result in the permanent loss of approximately seven on-street parking spaces. The details of these potential impacts and mitigation measures are presented in the Transportation Impacts Technical Memorandum. Additional parking spaces that would be temporarily lost during construction are described below.

Construction-Related Impacts

Traffic impacts due to construction activities for this alternative would be the same as the Fully Underground LRT Alternative – Little Tokyo Variation 1. However, this alternative also includes a proposed two-portal configuration on 1st Street east of Alameda Street. The construction of the eastbound portal would require the temporary closure of one eastbound and one westbound travel lane for extended time periods along 1st Street between Alameda and Vignes Streets. This would result in a reduction of roadway capacity and may potentially modify existing traffic flow patterns during construction activities. Travel times and intersection operations along this roadway segment would be impacted and delays would be expected to increase due to the potential for increased traffic congestion during peak periods.

However, the 1st Street Bridge is currently reduced to two lanes for an unrelated construction project, and lengthy delays do not frequently occur.

Construction activities and impacts to pedestrian and bicycle flow for this alternative would be the same as the Underground Emphasis LRT Alternative – Broadway Station Option west of Central Avenue and the same as the Fully Underground LRT Alternative – Little Tokyo Variation 1 for the proposed Alameda Street portal. Closure of the two travel lanes for extended time periods along 1st Street between Alameda and Vignes Streets would potentially impact the designated Class III bicycle route along 1st Street. The flow of bicycle traffic would be impacted due to the reduction of roadway capacity. The additional automobile traffic would result in increased turning movements, potentially reducing bicycle operating speeds or resulting in a greater risk of bicycle-automobile conflict, since Class III routes do not have bicycle-designated lanes.

The operational phase of the Fully Underground LRT Alternative – Little Tokyo Variation 2 would result in the restoration of the parking, pedestrian, bicycle, and auto facilities to their permanent configurations. Potential short term, adverse impacts are anticipated during construction of this alternative.

5.6.1.2 Indirect Impacts

Impacts from construction-related activities are temporary and direct in nature. No indirect impacts are anticipated for traffic circulation or parking under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.1.3 Cumulative Impacts

Impacts to traffic circulation during construction would be short term. However, it would contribute to a potential cumulative adverse effect when added to other projects in the downtown area. Therefore, cumulative adverse traffic circulation impacts are anticipated for the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.2 Displacements and Relocation

5.6.2.1 Direct Impacts

Permanent Impacts During Construction Period

To construct the Fully Underground LRT Alternative – Little Tokyo Variation 2, up to five additional full takes, one fewer partial take, and two additional permanent underground easements than the Underground Emphasis LRT Alternative would be required. This includes two more partial takes along 1st Street than would be required for the Fully Underground LRT Alternative –Little Tokyo Variation 1. These properties would be utilized for construction staging, below grade tunneling operations, and station construction. The details of these potential impacts and associated candidate mitigation measures are presented in the Displacements and Relocation of Existing Uses Technical Memorandum.

Construction-Related Impacts

During construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2, staging of construction equipment and materials would require temporary construction easements that would impact three fewer parcels than the Underground Emphasis LRT Alternative (five parcels in total). The portions of these parcels that would be utilized would be plazas and open areas. Access to businesses and existing buildings would be maintained. Some temporary sidewalk detours may be needed. Mitigation would minimize the potential adverse impacts associated with this type of displacement during construction. In addition, once construction is completed, the sites would be restored to their permanent configurations.

5.6.2.2 Indirect Impacts

Displacement impacts are direct in nature. Therefore, no indirect construction impacts associated with displacements or relocation are anticipated.

5.6.2.3 Cumulative Impacts

No cumulative adverse construction impacts associated with displacements or relocation are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.3 Community and Neighborhoods

5.6.3.1 Direct Impacts

Similar to the Underground Emphasis LRT Alternative, mobility would be reduced in the Bunker Hill and Little Tokyo areas due to street closures associated with construction activities, including track installation, cut and cover excavation, TBM deployment, structural support work. Disruption of traffic patterns would restrict access of residents and businesses, though to a lesser extent than the At-Grade Emphasis LRT Alternative. However, in Little Tokyo, there would be less disruption to traffic along Alameda and 1st Streets than the Underground Emphasis LRT Alternative because this alternative does not include the excavation and construction of the Alameda Street underpass and potential pedestrian bridge. Instead, the Fully Underground LRT Alternative – Little Tokyo Variation 2 includes an underground rail junction beneath the intersection of 1st and Alameda Streets, a portal near Temple and Alameda Streets, and two portals on 1st Street between Alameda and Vignes Streets. The installation of TBMs either at Little Tokyo or Bunker Hill would temporarily disrupt the communities, businesses, and residences, including Savoy and Honda Plaza in Little Tokyo and the Bunker Hill Towers. In addition the construction activity related to tunnel portal construction on 1st Street would extend about one half block further east. Without mitigation, potential adverse construction impacts associated with community and neighborhoods are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.3.2 Indirect Impacts

During utility relocation, mobility would be reduced in the Civic Center, Historic Core, and Little Tokyo areas. Disruption of traffic patterns would restrict access to residences and businesses, though to a lesser extent than the At-Grade Emphasis LRT Alternative and the Underground Emphasis LRT Alternative. This could impact the economic vitality of some businesses, particularly in Little Tokyo, where the community has expressed concern about construction activities. Prolonged disruption to businesses could affect the cohesion of some communities, including Little Tokyo. Without mitigation, potential adverse indirect construction impacts associated with community and neighborhoods are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.3.3 Cumulative Impacts

No cumulative adverse construction impacts associated with communities or neighborhoods are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.4 Visual Resources and Aesthetics

5.6.4.1 Direct Impacts

Views and Visual Character

During construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2, roughly similar construction staging areas would be utilized as the Underground Emphasis LRT Alternative. Impacts associated with views and visual character would be similar to the Underground Emphasis LRT Alternative with one exception: There would be fewer visual impacts in the Little Tokyo because large construction equipment would no longer be required for the excavation and construction of the Alameda Street underpass and potential pedestrian bridge. However, the Fully Underground LRT Alternative – Little Tokyo Variation 2 would require construction of an underground junction beneath 1st and Alameda Streets, a portal near Temple and Alameda Streets, and two portals on 1st Street between Alameda and Vignes Streets.

Lighting

A large portion of the construction would be conducted beneath the surface. However, there is a portion that would be at-grade where the tracks emerging from the portals would link to the existing Metro Gold Line tracks. During surface construction activities, temporary lighting may be necessary for nighttime work, which is typically scheduled in order to minimize disruption to daytime traffic and for nighttime lighting for staging sites, primarily for security. However, nighttime construction activities would be limited to non-residential areas and nighttime illumination of staging areas would be directed towards the site and away from sensitive uses. Therefore, less-than-significant impacts are anticipated.

5.6.4.2 Indirect Impacts

No indirect adverse construction impacts associated with visual resources are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.4.3 Cumulative Impacts

No cumulative adverse construction impacts associated with visual resources are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.5 Air Quality

5.6.5.1 Direct Impacts

Regional Construction Emissions

Additional excavation for the two-level underground station at 2nd Street and Central Avenue as well as from the additional underground alignment along Alameda and 1st Streets would occur under the Fully Underground LRT Alternative – Little Tokyo Variation 2. This would require additional truck trips to dispose of excavated material. This would intensify the potential impacts to air quality beyond those identified for the Underground Emphasis LRT Alternative. An analysis of construction-related emissions was completed in accordance with SCAQMD requirements. The estimate included emissions from off-road construction equipment, fugitive dust, construction worker commuting, and haul trucks. Table 5-12 provides a summary of daily construction emissions anticipated during peak activities for the entire project area.

Table 5-12. Fully Underground LRT Alternative – Little Tokyo Variation 2 (2014-2017) Maximum Daily Regional Construction Emissions

Daily Emissions (pounds/day)						
Location	VOC	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
2nd/Hope Street station (SEM)						
Onsite	**367**	**2,596**	**1,474**	5	105	**95**
Offsite	10	102	72	<1	25	7
Total	**377**	**2,698**	**1,545**	5	131	**102**
2nd/Hope Street station (Open Cut)						
Onsite	**176**	**2,670**	**1,523**	5	109	**98**

Table 5-12. Fully Underground LRT Alternative – Little Tokyo Variation 2 (2014-2017) Maximum Daily Regional Construction Emissions

Daily Emissions (pounds/day)						
Location	VOC	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
Offsite	10	107	74	<1	26	7
Total	**386**	**2,777**	**1,597**	5	135	**105**
Threshold	75	100	550	150	150	55

*Note: Significant emissions are shown in **bold**.*
Source: CDM, Metro Regional Connector Air Quality Technical Memorandum, 2010.

Use of electric construction equipment could be encouraged where feasible. Daily regional construction emissions are anticipated to exceed SCAQMD regional significance thresholds for VOC, NO_X, CO, and $PM_{2.5}$, and would result in a potentially adverse effect without mitigation.

Localized Construction Emissions

In addition to evaluating emissions on a regional level, construction emissions were compared to SCAQMD's localized significance thresholds. The maximum localized construction emissions would occur during cut and cover construction along Flower Street, cut and cover construction of the Flower/5th/4th Street station, and construction of the 2nd Street/Broadway station. Construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2 would result in maximum daily localized emissions of approximately 300 ppd of NO_X, 170 ppd of CO, 11 ppd of $PM_{2.5}$ and 13 ppd of PM_{10}. Daily construction emissions are anticipated to exceed SCAQMD localized significance thresholds for NO_X, and PM_{10}, and $PM_{2.5}$ and would result in a potentially adverse localized air quality construction effect.

5.6.5.2 Indirect Impacts

Construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2 would result in indirect emissions of TACs. Emissions from the project were compared to existing conditions (2009) for CEQA. A summary of the results of the Tier 1 HRA are provided in Table 5-12. Since VOC emissions will decrease in future years because of the improvement in engine technology, the HRA was not conducted for VOC emissions. Instead, it was limited to inorganic emissions. The Fully Underground LRT Alternative – Little Tokyo Variation 2 would not cause significant emissions of TACs under CEQA.

5.6.5.3 Cumulative Impacts

Daily regional and localized construction emissions are anticipated to exceed SCAQMD regional significance thresholds and would result in a potentially adverse cumulative effect without mitigation.

5.6.6 Noise and Vibration

5.6.6.1 Direct Impacts

Anticipated construction equipment and the related noise levels would be the same as those shown in Table 5-8 for the Underground Emphasis LRT Alternative.

The construction of the additional underground alignment along Alameda and 1st Streets would result in new sources of temporary noise and vibration that would not be part of the Underground Emphasis LRT Alternative. These sources would result in the same levels of noise and vibration as those described for Underground Emphasis LRT Alternative.

Additional construction activity would occur closer to sensitive receptors along Alameda and 1st Streets. This would intensify the impacts from noise and vibration compared to those identified for the Underground Emphasis LRT Alternative. The construction activities with the greatest potential to cause noise impacts would be construction of the cut and cover tunnel along Flower Street, cut and cover construction of the Flower/5th/4th Street station, cut and cover construction of the approach to 2nd/Hope Street station, construction of the 2nd/Hope Street station, cut and cover construction of the 2nd Street /Broadway station, and open cut construction of the 2nd Street/Central Avenue station. These activities would have the greatest potential for noise impacts due to the duration of the work and the proximity of construction activities to noise sensitive land uses.

Under the Fully Underground LRT Alternative – Little Tokyo Variation 2, the no at-grade junction or underpass would be constructed on Alameda Street. This would remove a potential temporary noise source in the Little Tokyo community that would occur for a two to three year period under the At-Grade and Underground Emphasis LRT Alternatives. However, an underground junction beneath 1st and Alameda Streets, a portal near Temple and Alameda Streets, and two portals on 1st Street between Alameda and Vignes Streets would be constructed as part of this alternative. Potential adverse effects from construction noise are anticipated without the implementation of mitigation measures.

The potential for construction vibration to cause building damage and annoyance impacts would be the same as identified under the Fully Underground LRT Alternative – Little Tokyo Variation 1. Without the implementation of mitigation measures, vibration impacts would be potentially significant under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.6.2 Indirect Impacts

Impacts from construction-related activities are temporary and direct in nature. No indirect impacts are anticipated from noise or vibration under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.6.3 Cumulative Impacts

Impacts from noise and vibration during construction would be short term and would not contribute to a cumulative adverse effect. Therefore, no cumulative adverse noise or vibration impacts are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.7 Geotechnical/Subsurface/Seismic/Hazardous Materials

5.6.7.1 Direct Impacts

Geotechnical/Subsurface/Seismic

The Fully Underground LRT Alternative – Little Tokyo Variation 2 proposed alignment would not cross any known faults. However, portions of the Fully Underground LRT Alternative – Little Tokyo Variation 2 proposed alignment occur in areas mapped with the potential for liquefaction based on soil stability. Areas susceptible to liquefaction are along Flower Street between Wilshire Boulevard and 2nd Street, and along 2nd Street between Hill and San Pedro Streets. A portion of the alignment near Alameda and 1st Streets would be within the mapped Inundation Hazard Area. In addition, the proposed 2nd/Hope Street station would be within the Hillside Ordinance area (Bunker Hill).

Geotechnical, subsurface, and seismic impacts during construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2 would be similar to those of the Underground Emphasis LRT Alternative during construction. Section 5.4.7.1 contains further analysis.

Hazardous Materials

Construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2 would entail excavation along most of the proposed alignment, during which contaminated soil and groundwater could be encountered. Hazardous material impacts during construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2 would be similar to those of the Underground Emphasis LRT Alternative during construction. Section 5.4.7.1 contains further analysis.

5.6.7.2 Indirect Impacts

No indirect adverse geotechnical, subsurface, seismic, or hazardous materials impacts are anticipated during construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2.

Table 5-13. Fully Underground LRT Alternative – Little Tokyo Variation 2 (2014-2017) Toxic Air Contaminant Construction Emissions and HRA						
TAC	CAS #	Emissions (pounds/hr)		PSL	PSI	
		2nd/Hope Street SEM	2nd/Hope Street Open Cut	(lb/hr)	2nd/Hope Street SEM	2nd/Hope Street Open Cut
Arsenic	7440-38-2	2.38E-05	2.46E-05	1.00E-04	2.38E-01	2.46E-01
Chlorine	7782-50-5	1.88E-03	1.95E-03	1.05E-01	1.79E-02	1.86E-02
Copper	7440-50-8	1.21E-04	1.25E-04	5.00E-02	2.41E-03	2.50E-03
Mercury	7439-97-6	1.31E-04	1.35E-04	9.00E-04	1.46E-01	1.51E-01
Nickel	7440-02-0	8.90E-05	9.20E-05	3.00E-03	2.97E-02	3.07E-02
				ASI	4.29E-01	4.44E-01
				Threshold	1.0	

Notes:
ASI = application screening index (total PSI)
CAS = Chemical Abstracts Service
lb/hr = pounds per hour
PSI = pollutant screening index (PSL divided by project emissions)
PSL = pollutant screening level (minimum level expected to exceed health risk)
TAC = toxic air contaminant
Source: CDM, Metro Regional Connector Air Quality Technical Memorandum, 2010.

5.6.7.3 Cumulative Impacts

No cumulative adverse geotechnical, subsurface, seismic, or hazardous materials impacts are anticipated during construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.8 Water Quality

5.6.8.1 Direct Impacts

Water quality impacts during construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2 would be similar to those of the Underground Emphasis LRT Alternative during construction. Section 5.4.8.1 contains further analysis.

5.6.8.2 Indirect Impacts

No indirect adverse construction impacts associated with water quality are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.8.3 Cumulative Impacts

No cumulative adverse construction impacts associated with water quality are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.9 Energy

5.6.9.1 Direct Impacts

The highest indirect energy consumption would occur during site clearance and construction of guideways, stations, and support facilities. Construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2 would result in a temporary energy demand of approximately 6,300 billion BTUs. This impact would be temporary, and the project would result in long-term, beneficial decreases in energy use in the region. LADWP is committed to increasing electricity generation from renewable energy sources and ensuring a reliable flow of electricity to users in its service area. Given the long-term, beneficial decreases in energy use associated with this alternative; potential construction-related impacts would not be significant.

5.6.9.2 Indirect Impacts

No indirect adverse construction impacts associated with energy are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.9.3 Cumulative Impacts

No cumulative adverse construction impacts associated with energy are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.10 Climate Change

5.6.10.1 Direct Impacts

No direct adverse construction impacts associated with climate change are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.10.2 Indirect Impacts

No indirect adverse construction impacts associated with climate change are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.10.3 Cumulative Impacts

The construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2 would result in GHG emissions from diesel-fueled construction equipment. Emissions would be generated by onsite equipment, offsite worker vehicles, and offsite haul trucks. A total of approximately 117,600 metric tons per year of GHG emissions would be produced during all phases of construction under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

The proposed project would result in a decrease in GHG emissions compared to the No Build Alternative and, due to regional growth unrelated to the project, an increase in GHG emissions compared to existing conditions (2009). This proposed alternative is consistent with CARB's Scoping Plan requirement to reduce GHG emissions. It is expected that other projects operating in 2035 would be consistent with the emission reduction targets of SB 375 and the Regional Transportation Plan. As a result, emissions would not be cumulatively significant.

5.6.11 Historic, Archaeological, and Paleontological Resources

5.6.11.1 Direct Impacts

The Fully Underground LRT Alternative – Little Tokyo Variation 2 would have the potential to alter, remove, or destroy archaeological and paleontological resources within the APE due to the creation of a new underground tunnel along its entire route and new underground stations. Potential archaeological and paleontological impacts during construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2 would be similar to those of the Underground Emphasis LRT Alternative during construction. Section 5.4.11.1 contains further analysis.

5.6.11.2 Indirect Impacts

The construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2 would have the potential to indirectly impact historical resources during cut and cover station and tunnel construction, portal construction, and TBM tunneling. The impacts would be indirect because the construction activities themselves would not damage historical properties, but vibration and possible subsidence of soils could potentially impact the historical integrity of buildings. Mitigation would minimize the potential adverse impacts.

5.6.11.3 Cumulative Impacts

No cumulative adverse construction impacts associated with historical, archaeological, or paleontological resources are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.12 Ecosystems and Biological Resources

5.6.12.1 Direct Impacts

During construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2, some mature trees containing nesting located along the proposed alignment could be removed. As these mature trees may provide potential nesting and roosting habitat for bird species, including raptors, removal or disturbance of this vegetation during the nesting season could directly impact the habitat and any bird species that are present. As no mature trees or other biological resources were observed in the area north and east of 1st and Alameda Streets, there are no additional direct impacts related to the Fully Underground LRT Alternative – Little Tokyo Variation 2. The same mitigation measures described in Section 6 would be required to reduce these potential impacts to a less-than-significant level.

5.6.12.2 Indirect Impacts

As with the other build alternatives, indirect impacts to migratory birds from the Fully Underground LRT Alternative- Little Tokyo Variation 2 would not be significant because the project area provides only low quality habitat for a small number of migratory birds and only a small number of birds (if any) could be displaced. Mitigation taken to comply with the MBTA and the California Fish and Game Code would reduce these potential indirect impacts to a less-than-significant level.

5.6.12.3 Cumulative Impacts

No cumulative adverse construction impacts associated with ecosystems or biological resources are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.13 Parklands and Other Community Facilities

5.6.13.1 Direct Impacts

A large portion of the alignment of the Fully Underground LRT Alternative – Little Tokyo Variation 2 would be constructed underground using TBM tunneling, so access restrictions on 2nd Street would be limited to staging areas. However, there would be temporary road closures in the vicinity of cut and cover construction activities. Access to parking structure beneath Maguire Gardens and pedestrian access to the gardens would be temporarily restricted, as in the Underground Emphasis LRT Alternative. Locations along the alignment that could experience modified pedestrian and vehicle access during construction include the new LAPD headquarters, Caltrans, and the Little Tokyo Branch Public Library. Other community resources, particularly in Little Tokyo, such as MOCA, Go for Broke Monument, and JANM, would have fewer impacts associated with restricted access because the Fully Underground LRT Alternative – Little Tokyo Variation 2 does not include an underpass at Alameda Street at 1st Street, a pedestrian bridge, or surface track work at the Alameda Street/1st Street intersection. However, this alternative does include construction of an

underground junction beneath 1st and Alameda Streets, construction of a portal near Temple and Alameda Streets, and construction of two portals on 1st Street between Alameda and Vignes Streets. The portals on 1st Street will be closer to the Los Angeles Hompa Hongwanji Temple than any of the other alternatives, placing potential construction activities and impacts such as noise in greater proximity to the Temple. Response times for emergency services could also be impacted by this alternative, but to a lesser extent than the At-Grade Emphasis LRT Alternative on 2nd Street. Without mitigation, potential adverse construction impacts associated with parklands and other community facilities are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.13.2 Indirect Impacts

Although construction impacts are direct by nature, the construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2 alignment could potentially discourage patrons of community facilities and parks due to restricted access and temporary parking restrictions. Mitigation could include signs, detour routes, and temporary replacement parking to encourage pedestrian and vehicular access to these community facilities. Without mitigation, potential adverse impacts are anticipated.

5.6.13.3 Cumulative Impacts

No cumulative adverse construction impacts associated with parklands and community facilities would be anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.14 Economic Vitality and Employment Opportunities

5.6.14.1 Direct Impacts

The construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2 would result in fewer potential adverse economic impacts in the project area than the Underground Emphasis LRT Alternative. Depending on the construction techniques used, there may be a need for phased street closure. However the economic effects of these closures would not be as severe as the At-Grade Emphasis LRT Alternative and Underground Emphasis LRT Alternative due to lack of significant at-grade track construction and an Alameda Street underpass and pedestrian bridge. This alternative would include an underground junction beneath 1st and Alameda Streets, a portal near Temple and Alameda Streets, and two portals on 1st Street between Alameda and Vignes Streets. The economic impacts caused by the Fully Underground LRT Alternative – Little Tokyo Variation 2 would be primarily limited to the station sites, and would be similar to the Underground Emphasis LRT Alternative.

Investment in transportation, including direct investment in the form of capital construction and operations costs, provides economic benefits through the creation of direct and indirect jobs and spending by suppliers whose goods and services are used in the project. These benefits are discussed in the Economic and Fiscal Impacts Technical Memorandum. The

benefits of the additional transit infrastructure in the long-term would outweigh the temporary significant impacts in the project area.

5.6.14.2 Indirect Impacts

As discussed in Section 5.6.3, construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2 would result in the temporary closure of several streets. During utility relocation and lane closures, traffic would be diverted to surrounding streets. The traffic diversions and parking restrictions could potentially impact the economic viability of businesses adjacent to the closures, though to a lesser extent than the At-Grade Emphasis LRT Alternative. Although these potential construction impacts would short-term and intermittent, they would be considered potentially adverse without mitigation.

5.6.14.3 Cumulative Impacts

No cumulative adverse construction impacts associated with economic vitality are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.15 Safety and Security

5.6.15.1 Direct Impacts

The contractor will have a safety plan and be responsible for construction site security in conformance with local regulations and standards. Construction activities are not anticipated to affect security in the project area. Construction staging areas would typically be fenced off with restricted access and well lit. A large portion of the construction would occur underground, separated from pedestrians and vehicles. No direct adverse impacts associated with safety or security are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.15.2 Indirect Impacts

No indirect adverse construction impacts associated with safety or security are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

5.6.15.3 Cumulative Impacts

No cumulative adverse construction impacts associated with safety or security are anticipated under the Fully Underground LRT Alternative – Little Tokyo Variation 2.

6.0 POTENTIAL MITIGATION MEASURES

Construction impacts are typically short-term and temporary. The following potential mitigation measures would minimize the potential adverse impacts associated with construction that were identified in Section 5.

6.1 No Build Alternative

6.1.1 Direct Impacts

No direct adverse impacts associated with construction-related activities are anticipated under the No Build Alternative. Therefore, no mitigation measures would be required.

6.1.2 Indirect Impacts

No indirect adverse impacts associated with construction-related activities are anticipated under the No Build Alternative. Therefore, no mitigation measures would be required.

6.1.3 Cumulative Impacts

No cumulative adverse impacts associated with construction-related activities are anticipated under the No Build Alternative. Therefore, no mitigation measures would be required.

6.2 Transportation Systems Management (TSM) Alternative

6.2.1 Direct Impacts

No direct adverse impacts associated with construction-related activities are anticipated under the TSM Alternative. Therefore, no mitigation measures would be required.

6.2.2 Indirect Impacts

No indirect adverse impacts associated with construction-related activities are anticipated under the TSM Alternative. Therefore, no mitigation measures would be required.

6.2.3 Cumulative Impacts

No cumulative adverse impacts associated with construction-related activities are anticipated under the TSM Alternative. Therefore, no mitigation measures would be required.

6.3 At-Grade Emphasis LRT Alternative

6.3.1 Direct Impacts

6.3.1.1 Transportation, Circulation, and Parking

During the final design phase of the project, site and street specific Worksite Traffic Control Plans would be developed in cooperation with the LADOT to accommodate the required

traffic, pedestrian, and bicycle movements. To the extent practical, traffic lanes would be maintained in both directions, particularly during the morning and afternoon peak traffic hours. Access to adjacent businesses, via existing or temporary driveways, would be maintained throughout the construction period. In some cases, specific construction techniques may be utilized by the contractor to minimize construction envelopes. This could include the use of segmental construction, which would help minimize the need for extensive falsework on the ground. Apart from the proposed elimination of eastbound travel between Hill and Main Streets on 2nd Street, at least one traffic lane in each direction in addition to pedestrian access would be maintained during construction activities. Alternately, the construction contractor may elect to close 2nd Street entirely during construction between Figueroa and Los Angeles Streets. Designated haul routes for trucks would be identified during the final design phase of the project. These routes would be identified and located so as to minimize noise, vibration, and other possible impacts to adjacent businesses and neighborhoods. Following completion of the project, slight roadway restorations may be needed in areas that experienced frequent project-related truck trips.

A parking mitigation and circulation plan would be developed by the contractor in coordination with Metro and LADOT prior to construction to minimize impacts on curb parking. It may be possible to sequence construction activities so that multiple blocks of on-street parking are not temporarily removed simultaneously. This strategy would maximize the number on-street parking spaces available near the construction area. Some of the proposed parking mitigation measures associated with permanent parking displacements could be developed early so that they may be utilized during the construction. Metro may also lease parking lots for construction employees, if necessary.

After implementation of the proposed mitigation measures, construction-related traffic, parking, pedestrian, and bicycle impacts would still be considered potentially significant and unavoidable.

6.3.1.2 Displacements and Relocation

Where temporary construction easements are unavoidable, Metro would follow the provisions of the Uniform Act, as amended and implemented pursuant to the Uniform Relocation Assistance and Real Property Acquisition Regulations for Federal and Federally Assisted Programs adopted by the United States Department of Transportation (USDOT), dated February 3, 2005. Metro would apply acquisition and relocation policies to assure compliance with the Uniform Act and amendments. All real property acquired by Metro would be appraised to determine its fair market value. Just compensation, which would not be less than the approved appraisal made to each property owner, would be offered by Metro.

Potential adverse impacts associated with temporary construction easements are anticipated due to the construction and operation of the At-Grade Emphasis LRT Alternative. The following potential mitigation measures would result in no adverse impacts.

- Access to the Little Tokyo Library Branch would be maintained at all times during construction of the At-Grade Emphasis LRT Alternative.

- Adequate bus stop relocation and route detours would be implemented where bus stops would be displaced due to street closures. Adequate signage and noticing indicating the relocated bus stop would be placed at strategic locations, as determined by Metro Operations.

6.3.1.3 Community and Neighborhood Impacts

Potential adverse impacts associated with community and neighborhoods are anticipated due to construction of the At-Grade Emphasis LRT Alternative. Implementation of the following proposed mitigation measures would result in no adverse impacts.

- Whenever possible, detours would be developed for any roadways or sidewalks that must be closed during construction. Signs would be posted in appropriate languages to alert pedestrians and vehicles of any road or sidewalk detours. Pedestrian detours would be accessible to seniors and disabled persons.

- Early notification would be given to emergency service providers of any road closures or detours.

- A community outreach plan would be developed to notify local communities of construction schedules, road and sidewalk detours. Metro would coordinate with local communities during preparation of the traffic management plans to minimize potential construction impacts to community resources and special events. Efforts would be made to limit construction activities during special events when possible.

- Metro would develop a construction mitigation plan with community input to directly address specific construction impacts in the Little Tokyo community.

6.3.1.4 Visual Resources and Aesthetics

Implementation of the following mitigation measure would reduce the potential impacts to visual resources and aesthetics to a less than significant level.

- Construction staging areas outside of the public right-of-way (ROW) would be located adjacent to non-residential land uses to the maximum extent possible. In the event a building or site contains mixed land uses, with residential units above offices or retail, that site would be considered residential for staging purposes. If complete avoidance of adjacent residential properties is not possible, then construction staging would be screened from the residential land uses.

6.3.1.5 Air Quality

The effects of lane closures and intersection improvements during construction activities would reduce traffic speeds and result in increased emissions, particularly CO emissions, at major points of delay. Detour routes would ensure that traffic does not idle for extended periods of time, thus reducing the potential for localized exceedances of the federal CO standards. Construction-related air quality impacts would be temporary. With the implementation of mitigation measures, the potential adverse construction effects would still be significant and unavoidable.

- Water or a stabilizing agent would be applied to exposed surfaces in sufficient quantity to prevent generation of dust plumes.
- Track-out would not extend 25 feet or more from an active operation and track-out would be removed at the conclusion of each workday.
- Contractors would be required to utilize at least one of the measures set forth in South Coast Air Quality Management District Rule 403 section (d)(5) to remove bulk material from tires and vehicle undercarriages before vehicles exit the project site.
- All haul trucks hauling soil, sand, and other loose materials would maintain at least six inches of freeboard in accordance with California Vehicle Code Section 23114.
- All haul trucks hauling soil, sand, and other loose materials would be covered (e.g., with tarps or other enclosures that would reduce fugitive dust emissions).
- Traffic speeds on unpaved roads would be limited to 15 mph.
- Operations on unpaved surfaces would be suspended when winds exceed 25 mph.
- Heavy equipment operations would be suspended during first and second stage smog alerts.
- On-site stockpiles of debris, dirt, or rusty materials would be covered or watered at least two times per day.
- Contractors would use non-electric equipment and non-electric vehicle engines built in 2014 or later.
- Contractors would utilize electricity from power poles rather than temporary diesel or gasoline generators, as feasible.
- Heavy-duty trucks would be prohibited from idling in excess of five minutes, both on- and off-site.

- Construction parking would be configured to minimize traffic interference.
- Construction activity that affects traffic flow on the arterial system would be limited to off-peak hours, as feasible.

6.3.1.6 Noise and Vibration

Noise-control measures during construction would be required to minimize adverse effects on existing noise-sensitive land uses. All construction activities would have to comply with local noise ordinances and noise regulations. The measures listed in this section are examples of those that would be incorporated and should be re-evaluated in greater detail during preliminary design because adverse effects to residences cannot be accurately determined without detailed construction plans and schedules. During the construction phase of the project, sensitive and/or historic buildings within 21 feet of the construction may be susceptible to vibration damage. If survey of the structures finds buildings susceptible to vibration damage, a monitoring plan would be developed and committed to during project construction to ensure appropriate measures are taken to avoid any damage to historic buildings due to construction-induced vibration. These measures would also further reduce annoyance from ground borne vibration to sensitive land uses. General mitigation measures presented below are guidelines in developing measures to reduce construction noise and vibration. The measures would be incorporated into site-specific construction plans to minimize adverse noise effects to sensitive receivers along the project corridor. Equipment noise emission limits also would be developed and/or adopted from existing sources. Construction hours would be set, and construction activity noise level emission criteria would be determined and compliance required during construction. With the implementation of mitigation measures, no substantial adverse noise and vibration construction effects are anticipated.

- When possible, maintaining distances greater than those provided in Table 5-2 would help to avoid potential construction-related vibration damage.
- Where construction vibration may be problematic, Metro would use less vibration-intensive construction equipment or techniques near vibration-sensitive structures or operations to reduce the potential for damage or annoyance from ground borne vibration.
- Heavily laden vehicles would be routed away from vibration-sensitive locations.
- Earthmoving equipment would be routed as far away as possible from vibration-sensitive locations by site layout considerations. Metro would use chemical splitting or hydraulic jack splitting and drilled soldier piles would be used instead of high impact methods.

- Construction activities that produce vibration such as demolition, excavation, earthmoving, and ground impacting would be sequenced such that the vibration sources operate separately and not simultaneously.
- Nighttime construction activities that produce noticeable vibration would be avoided because people are more likely to be home and more sensitive to vibration at night.
- The smallest vibration-producing device possible to accomplish necessary tasks while minimizing excess vibration would be used.
- Non-impact demolition and construction methods would be selected, such as saw or torch cutting and removal for off-site demolition; chemical splitting or hydraulic jack splitting would be used instead of high impact methods.
- Use of pavement breakers and vibratory rollers and packers would be avoided near sensitive uses.
- Temporary sound wall and noise blankets would be installed at off-street construction staging sites where activity on the site will be continuous such as the TBM launch and excavation sites, the station sites. These walls would be decorated with local artistry and maintained regularly.

6.3.1.7 Geotechnical/Subsurface/Seismic/Hazardous Materials

Implementation of the proposed mitigation measures and plans would result in no adverse geotechnical, subsurface, seismic, or hazardous materials impacts during construction.

- Design criteria would be established during project design that requires the construction contractor to limit movement to less than an acceptable threshold value as a performance standard. This acceptable threshold standard would be a function of several factors including but not limited to the type of structure and its existing condition. Additional data and survey information would be gathered during preliminary engineering for each building to enable assessment of the tolerance of the subject structures. In addition, standard threshold criteria and guidelines published by agencies and for similar type of structures would be reviewed. Additional geotechnical studies would be performed to define the nature of the soils and to refine the means of achieving the performance specification.
- Ground improvement such as grouting or other methods to fill voids where appropriate and offset potential settlement when excess material has been removed during excavation would be required. The criteria for requiring grouting or ground improvement would be based on the additional data collection and reviews as noted above and the acceptable threshold value.

- The tunnel alignment would be grouted in advance to provide adequate soil support and minimize settlement as geotechnical conditions require.
- Settlement would be monitored along project alignment using a series of measuring devices above the route of the alignment. Leveling surveys would be conducted prior to tunneling, to monitor for possible ground movements.
- A preconstruction survey of buildings would be conducted to establish a baseline for measuring potential construction-induced damage.
- Tunnel construction monitoring requirements would be described and defined. In addition, provisions could be included to use the Earth Pressure Balance or Slurry TBM for tunnel construction to minimize ground loss. During tunnel construction, the soils encountered would be monitored relative to anticipated soil conditions as described in a Geotechnical Report.

A Contaminated Soil/Groundwater Management Plan would be implemented during construction to establish procedures to follow if contamination is encountered. The Plan would be prepared during the Final Design phase of the project, and the construction contractor would be held to the level of performance specified in the Plan. The Plan would include the following:

- Notification procedures and contact information for appropriate regulatory agencies;
- Procedures for sampling and analysis of soil and/or groundwater known or suspected to be impacted by hazardous materials;
- Procedures for the proper handling, storage, transport, and disposal of contaminated soil and/or groundwater, in consultation with regulatory agencies;
- Dust control measures (e.g., soil wetting, wind screens, etc.) for contaminated soil;
- Groundwater collection, treatment and discharge procedures and applicable standards.

A Worker Health and Safety Plan would be implemented prior to the start of construction activities. All workers would be required to review the plan, receive training if necessary, and sign the plan prior to starting work. The plan would, at a minimum, identify the following:

- Properties of concern and the nature and extent of contaminants that could be encountered during excavation activities;

- All appropriate worker, public health, and environmental protection equipment and procedures;
- Emergency response procedures, including most direct route to a hospital; and
- The Site Safety Officer.

During construction of the underground portions of the At-Grade Emphasis LRT Alternative mitigation would be required to address the potential for the creation of a preferential pathway and resulting spread of existing groundwater contamination. This could entail the use of impermeable grout where necessary to fill the gap between the tunnel and the surrounding earth along underground portions of the alignment where groundwater contamination exists.

To reduce potential impacts from subsurface gases associated with oilfields in the vicinity of the project area, mitigation measures would be implemented during construction of the underground portions of the At-Grade Emphasis LRT Alternative to address both exposure to toxic gases and the risk of explosion. This would be particularly important in methane zones and methane buffer zones, but testing would be required in all underground segments, as oilfield gases could occur outside of mapped zones. Specific precautions to protect workers and the public from exposure to toxic gases would be required, and specialized excavation methods would be needed to prevent explosion. Prior to building demolition, surveys of asbestos containing materials and lead-based paint would be conducted. If necessary, destructive sampling would be used. All asbestos containing materials and lead-based paint would be removed or otherwise abated prior to demolition. Removal and abatement activities would comply with all applicable laws, regulations, and rules.

6.3.1.8 Water Resources

If contaminated groundwater is encountered during initial drilling and water quality testing prior to construction, and it is determined that there is potential for the contamination to spread, this would be mitigated during the design and engineering process. For example, it could be specified that impermeable concrete-based grouting materials be used to fill the gap between the tunnel and the surrounding earth. The permeability of grouting materials is lower than surrounding soil types and this would reduce the possibility that the tunnel could serve as a preferential pathway for contaminant migration. Additional best management practices (BMPs) that would address potential impacts from encountering contaminated groundwater and groundwater dewatering activities are proposed in the Geotechnical/Subsurface/Seismic/Hazardous Materials Technical Memorandum.

Additional potential construction mitigation measures could include:

- Establishment of an erosion control plan prior to the initiation of construction activities. The erosion control plan would include:
  - Use of natural drainage, detention ponds, sediment ponds, or infiltration pits to allow runoff to collect and reduce or prevent erosion;
  - Use of barriers to direct and slow the rate of runoff and to filter out large-sized sediments;
  - Use of down-drains or chutes to carry runoff from the top of a slope to the bottom; and,
  - Control of water use for irrigation and dust control so as to avoid off-site runoff.

Potentially significant impacts to water quality stemming from construction of the Regional Connector project could be mitigated with the following measures as appropriate;

- Project design that includes properly designed and maintained biological oil and grease removal systems in new storm drain systems to treat water before it leaves project sites;
- Proper storage of hazardous materials to prevent contact with precipitation and runoff;
- Development and maintenance of an effective monitoring and cleanup program for spills and leaks of hazardous materials;
- Placement of equipment to be repaired or maintained in covered areas on a pad of absorbent material to contain leaks, spills, or small discharges;
- Periodic and consistent removal of landscape and construction debris;
- Removal of any significant chemical residue on the project sites through appropriate methods;
- Use of non-toxic alternatives for any necessary applications of herbicides or fertilizers;
- Installation of detention basins to remove suspended solids by settlement; and/or,
- Periodic monitoring of the water quality of runoff before discharge from the site and into the storm drainage system.

6.3.1.9 Cultural/Archeological Resources

Historic Resources

- MM-BE-1 Historic Properties/Historical Resources Documentation. Documentation of historic properties and historical resources adversely affected by the project would consist of the development of individual Historic American Building Survey/Historic American Engineering Record (HABS/HAER) submissions. The HABS/HAER documents would be prepared so that the original archival-quality documentation could be donated for inclusion in the Library of Congress if the National Park Service accepts these materials. Archival copies of the documentation would also be offered for donation to local repositories, including the Los Angeles Central Library and the Los Angeles Conservancy. The appropriate level of recordation would be established in consultation with the California SHPO and formalized as a part of MM-BE-5.

- MM-BE-2 Pre-Construction Baseline Survey And Geo-Technical Investigations. A survey of historic properties and/or historical resources within 21 feet of vibration producing construction activity would be conducted to assess the building category and the potential for GBV to cause damage. The survey would also be used to establish baseline, preconstruction conditions for historic properties and historical resources. During preliminary and final design of the project, subsurface (geotechnical) investigations would be undertaken under this measure to evaluate soil, groundwater, seismic, and environmental conditions along the alignment. This analysis would assist in the development of appropriate support mechanisms for cut and fill construction areas. The subsurface investigation would also identify areas that could experience differential settlement as a result of using a tunnel boring machine in close proximity to historic properties and/or historical resources. An architectural historian or historical architect who meets the Secretary of the Interior's Professional Qualification Standards would provide input and review of final design documents prior to implementation of measures (36 CFR Part 61).

- MM-BE-3 Building Protection Measures, Geotechnical and Vibration Monitoring, and Post Construction Survey. For those historic properties and historical resources that have the potential to be affected or impacted by ground borne vibrations and/or differential settlement, Metro would use building protection measures such as underpinning, soil grouting, or other forms of ground improvement, as well as lower vibration equipment an/or construction techniques. These techniques, combined with a geotechnical and vibration monitoring program, would help protect identified historic properties and historical resources. The historic property and historical resource protection measures as well as the geotechnical and vibration monitoring program would be reviewed by an architectural historian or historical architect who meets the Secretary of the Interior's Professional Qualification Standards (36 CFR Part 61) to ensure that the measures would adequately protect the properties/resources. A

post construction survey would also be undertaken to ensure that no adverse effects or significant impacts had occurred to historic properties and historical resources.

- MM-BE-4 TBM Specifications/Requirements Near Historic Properties And Historical Resources. For those historic properties and historical resources that have the potential to be affected or impacted by differential settlement caused by TBM construction, a contractor would be required to develop and use an earth pressure balance or slurry shield tunnel boring machine. The method of machine operation would be based on the anticipated ground conditions near historic properties and historical resources. These construction methods and machinery types would reduce the potential for differential settlement near historic properties and historical resources.

- MM-BE-5 Memorandum of Agreement. For those historic properties and historical resources that would be anticipated to experience adverse effects, a memorandum of agreement would be developed to resolve those adverse effects consistent with 36 CFR 800. This agreement, developed by FTA and Metro in consultation with the CA SHPO and other consulting parties would resolve and/or avoid, minimize, or mitigate potential effects to historic properties and/or historical resources. The agreement would include stipulations that outline the specific requirements for consultation and decision making between the lead federal agency and consulting parties, specify the level of HABS/HAER recordation, outline specific requirements for pre- and post-construction surveys, geotechnical investigations, building protection measures, and TBM specifications.

Archaeological Resources

The Regional Connector Transit Corridor project may impact one or more National Register- or California Register-eligible archeological sites, including the Los Angeles zanja system (the Zanja Madre, CA-LAN-887H, and numerous unrecorded numbered zanjas) and sites CA-LAN-3588, P-19-003338, and P-19-003339, along with an unknown number of previously unidentified archeological resources.

Construction-related impacts to potentially significant archeological sites would be avoided by project design where possible. Zanja segments have been encountered in the project vicinity as shallow as 0.45 m (1.5 feet) below current grade (Zanja 6-1; P-19-003352) and as deep as 3.0 m (9.8 feet) below grade (Zanja Madre [CA-LAN-887H]; Slawson 2006). The use of deep-tunneling construction techniques, as opposed to cut and cover methods, for the underground portions of the proposed alignments may avoid impacts to this resource, although vibration effects caused by tunneling machinery must be taken into account as well. Site CA-LAN-3588 occupies a portion of the city block currently bounded by Alameda, Temple, Vignes, and 1st Streets. Sites P-19-003338 and P-19-003339 are located on 1st Street between Hewitt and Garey Streets. The avoidance of ground-disturbing construction activities within

these areas may circumvent impacts to these resources. In the event that resource avoidance is not possible, and to mitigate impacts to previously unidentified archeological resources, the following mitigation measures could be implemented.

Treatment of Undiscovered Archeological Resources

A detailed Cultural Resources Monitoring and Mitigation Plan (CRMMP) would be prepared prior to implementation of this project, similar in scope to the CRMMP that was prepared for Metro Gold Line to East Los Angeles (Glenn and Gust 2004). Implementation of a CRMMP during ground disturbance in highly sensitive archeological areas would ensure that cultural resources are identified and adequately protected. If cultural resources are discovered or if previously identified resources are affected in an unanticipated manner, the Monitoring Plan would also ensure that such resources receive mitigation to reduce the impact to less than significant levels. This plan would include, but not be limited to, the following elements, which are described briefly in the Archeological Technical Memorandum:

- Worker training
- Archeological monitoring
- Scientific evaluation and mitigation of archeological discoveries
- Native American participation, as needed
- Appropriate treatment of human remains, if applicable
- Reporting of monitoring and mitigation results

Treatment of Known Archeological Resources

The destruction of a resource that is eligible for listing in the National Register or California Register would be a significant adverse effect. This effect may be resolved through the implementation of a Memorandum of Agreement (MOA) between FTA, Metro, and the SHPO, as well as other interested parties. For the purposes of this report, four archeological sites that are either within or immediately adjacent to the direct APE are presumed eligible for listing on both the National Register and the California Register. These include the Los Angeles zanja system (the Zanja Madre, CA-LAN-887H, and numerous unrecorded numbered zanjas) and sites CA-LAN-3588, P-19-003338, and P-19-003339.

Effects to the data potential of archeological sites can be mitigated to a less than significant level through the preparation and implementation of a data recovery plan under Section 106 and CEQA. The actual measures agreed upon in the MOA may vary in substance and degree, but the MOA would include a process to resolve any adverse effects upon archeological resources within the direct APE that are eligible for listing in the National Register or

California Register. The treatment of sites CA-LAN-3588, P-19-003338, and P-19-003339 may include systematic and scientific exposure, evaluation, and if necessary, archeological data recovery.

Los Angeles Zanja System

The Los Angeles Zanja system was an extensive and integrated water conveyance network that served large areas of the city for multiple generations. Generally speaking, previous construction projects in downtown Los Angeles have unexpectedly encountered and documented limited exposures of a single zanja segment, often after the segment has been damaged by construction equipment. This incomplete approach does not permit the evaluation of the overall zanja system, given the requirements that the OHP clarified in their recent letter (Toffelmier 2009). It is likely that other projects (such as emergency utility repair) have damaged segments of the zanja system without documentation. This repeated damage (both monitored and unmonitored construction impacts) constitutes a cumulative effect/impact that should be mitigated. Construction monitoring alone is insufficient mitigation to address this effect/impact, particularly given the likelihood of damaging the zanjas prior to discovery during project construction process. Project-related inadvertent damage to the zanjas may constitute an adverse effect under the Criteria of Adverse Effect, "physical destruction or damage" (36 CFR Part 800.5(a) (2) and material impairment as defined in CEQA. This action would contribute to, rather than mitigate, these cumulative effects/impacts.

Both Section 106 of the National Historic Preservation Act (as amended) and the California Environmental Quality Act require the identification, documentation, and evaluation of historic properties/historic resources in a project area (or direct Area of Potential Effects, APE). For a poorly mapped and buried linear resource like the zanja system, identification alone is challenging. Rather than a costly archeological excavation program or a remote sensing (ground penetrating radar, etc.) survey that is unlikely to produce clear-cut results, we recommend a proactive identification and documentation program that would facilitate preservation or mitigation in a cost-effective manner. Using additional documentary research to identify, as accurately as possible, the precise alignments of the zanjas within the APE would facilitate mitigation. Where these alignments are expected to be affected by the proposed project, a limited archeological investigation (e.g., mechanical trenching at the direction of a qualified archaeologist) immediately preceding project construction would be an efficient and economical method to identify intact zanja segments.

The documentation and evaluation of the Los Angeles Zanja system would be best accomplished with a system-wide approach that incorporates historical, archeological, and engineering research and documentation. This systemic approach to documentation and evaluation is a particularly appropriate mitigation measure for the Regional Connector Transit Corridor project, which has the potential to impact multiple zanja segments. The documentation of the zanja segments' alignments and slopes would have the added benefit

of enabling future projects to more accurately predict the location of zanja segments outside of the project area.

To mitigate potential impacts to the Los Angeles Zanja system, the project MOA would provide that the system be adequately documented under the direction of an experienced archaeologist and an experienced historical architect, architectural historian, or historian, both meeting the Secretary of the Interior's qualification standards. This documentation would include a combination of historical research, archeological testing, and architectural documentation, and would be followed by a formal evaluation of National Register and California Register eligibility. It is important to note that substantial documentation already exists for the zanja system in the form of maps and engineering records, published books and articles, unpublished technical reports, and site records. The collation of available data for the system as a whole would accomplish much of the documentation effort that is advocated here, while intensive, original research would be restricted to the zanja segments that cross the direct APE.

Such research and documentation may include such specific measures as:

- Historical research using historical maps, photographs, and other written sources to document the creation, maintenance, modification, and abandonment of the system.
- Archeological research to establish the physical condition, presence of associated features and artifacts, and precise location of each zanja segment within the project's direct APE through the use of physical exposure through controlled excavation and/or remote sensing. Resources would be documented using California Department of Parks and Recreation (DPR) series 523 primary and detail forms, maps, and photographs. The results would be presented in a detailed technical report following Archeological Resource Management Report (OHP 1990) guidelines that addresses research questions and assesses the National Register and California Register eligibility of the system.
- Architectural documentation of exposed zanja segments through the production of narrative records, measured drawings, and photographs in conformance with Historic American Engineering Record (HAER) standards prior to any alteration or demolition activity.
- Preserving the results of the historical, archeological, and historic architectural studies in repositories such as the local main library branch, the lead agency headquarters library, and with identified non-profit historic groups interested in the subject matter.
- Interpreting the Los Angeles zanja system for the public through signage along the project alignment, visual representations of zanja alignments using colored pavement, or other appropriate means such as a dedicated internet website.

6.3.1.10 Paleontological Resources

The following mitigation measures have been developed in accordance with the SVP (1995) standards and guidelines and meet the paleontological requirements of CEQA. These mitigation measures have been used throughout California and have been demonstrated to be successful in protecting paleontological resources while allowing timely completion of construction.

- MM-P-1. A qualified paleontologist would produce a Paleontological Monitoring and Mitigation Plan for the proposed project and supervise monitoring of construction excavations. Paleontological resource monitoring would include inspection of exposed rock units during active excavations within sensitive geologic sediments. The monitor would have authority to temporarily divert grading away from exposed fossils to professionally and efficiently recover the fossil specimens and collect associated data.

- MM-P-2. All project-related ground disturbances that could potentially affect the Puente Formation, Fernando Formation, and Quaternary older alluvium and terrace deposits would be monitored by a qualified paleontological monitor on a full-time basis (where feasible) because these geologic sediments are determined to have a high paleontological sensitivity (Figure 4-3). Very shallow surficial excavations (less than 5 feet) within Quaternary younger alluvium would be monitored on a part-time basis to ensure that underlying sensitive units are not adversely affected (Figure 4-3). Construction monitoring during any tunneling activity is not warranted as any potential fossil specimens present within sensitive geologic units would be crushed and destroyed by the nature of tunneling methodology.

- MM-P-3. At each fossil locality, field data forms would be used to record pertinent geologic data, stratigraphic sections would be measured, and appropriate sediment samples would be collected and submitted for analysis.

- MM-P-4. Due to the likelihood of the presence of microfossils, matrix samples would be collected and tested within the Puente Formation and Fernando Formation. Testing for microfossils would consist of screen-washing samples (approximately 30 pounds) to determine if significant fossils are present. Productive tests would result in screen-washing of additional bulk matrix up to a maximum of 2,000 pounds per locality to ensure recovery of a scientifically significant sample.

- MM-P-5. Recovered fossils would be prepared to the point of curation, identified by qualified experts, listed in a database to facilitate analysis, and reposited in a designated paleontological curation facility (such as the Natural History Museum of Los Angeles County).

- MM-P-6. The paleontologist would prepare a final monitoring and mitigation report to be filed, at a minimum with Metro and the repository.

6.3.1.11 Ecosystems and Biological Resources

Federal and state migratory bird protection would require mitigation measures to address potential impacts to nesting bird species from the potential disturbance of trees within the proposed build alternative alignments. Trees that could potentially be disturbed include a portion of the approximately 250 trees located within the proposed alignment and station footprints for the At-Grade Emphasis LRT Alternative. The following potential mitigation measures would apply to all of the proposed build alternatives.

The first potential mitigation would be to avoid tree disturbances as much as possible. As project design progresses, it may be possible to reduce the number of trees potentially disturbed by avoidance or fencing. It may also be possible to reduce the scale of disturbance by trimming individual trees instead of removing them completely.

The second potential mitigation would be to time necessary tree removal and trimming activities to seasons outside of the bird breeding season, which can extend from February 1 to August 31. If it is not feasible to avoid tree removal and trimming related to construction during the breeding bird season from February 1 to August 31, breeding bird surveys would be conducted as recommended by the California Department of Fish and Game. Two biological surveys would be conducted, one 15 days and a second 72 hours prior to construction activities that would remove or disturb suitable nesting habitat. The surveys would be performed by a biologist with experience conducting breeding bird surveys. The biologist would prepare survey reports documenting the presence or absence of active nests of any protected native bird in the habitat to be removed and any other such habitat within 300 feet of the construction work area (or within 500 feet for raptors). If an active nest is located, construction within 300 feet of the nest (or 500 feet for raptor nests) would be postponed until the nest is vacated, juveniles have fledged, and there is no evidence of a second attempt at nesting.

If construction of the project requires removing any of the native trees located along the proposed alignment and stations for any of the build, a removal permit would be required from the Los Angeles Board of Public Works in accordance with the City of Los Angeles Native Tree Protection Ordinance. The tree removal permit may require replanting of native trees within the project area or at another location within the City of Los Angeles to mitigate for the removal of these trees. The City's ordinance requires replacement of protected trees at a 2:1 ratio and other trees at a 1:1 ratio. If construction would require pruning of any protected native tree, the pruning would be performed in a manner that does not cause permanent damage or adversely affect the health of the trees.

6.3.1.12 Parklands, Community Facilities, and Section 4(f)

Metro would prepare a traffic management plan to facilitate the flow of traffic in and around the construction zone and reduce restrictions to the access of public services along the alignment to the greatest extent feasible. This traffic management plan would include the following measures:

- Scheduling a majority of construction-related travel (i.e., deliveries, hauling, and worker trips) during the off-peak hours;
- Developing detour routes to facilitate traffic movement through construction zones without significantly increasing cut-through traffic in adjacent residential areas;
- Where feasible, temporarily re-striping roadway to maximize the vehicular capacity at those locations affected by construction closures;
- Where feasible, temporarily removing on-street parking to maximize the vehicular capacity at those locations affected by construction closures;
- Where feasible, stationing traffic control officers at major intersections during peak hours to minimize delays related to construction activities;
- Developing and implementing an outreach program to inform the general public about the construction process and planned roadway closures;
- Developing and implementing a program with business owners to minimize impacts to businesses during construction activity, including but not limited to signage programs.

6.3.1.13 Economic and Fiscal

Potential mitigation measures would apply to construction-related effects to minimize the economic construction effects of the proposed project. With implementation of the following mitigation measures no adverse economic effects would occur during construction.

- Compensation to property owners for acquisition of property in compliance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.
- Relocation assistance offered affected property and business owners in compliance with the California Relocation Act
- Measures to assist business owners significantly impacted by temporary construction activity (temporary parking, marketing programs, and other measures to be identified by Metro working with the appropriate businesses).

- Replacement parking locations and strategies (Metro is committed to implementing a feasible parking mitigation plan that would reduce parking impacts to a less than significant level).

6.3.1.14 Safety and Security

The following potential mitigation measures would apply to construction-related effects to minimize the construction effects of the proposed project.

- Providing alternate walkways for pedestrians around construction staging sites in accordance with American with Disability Act (ADA) requirements.
- Signing and properly marking all pedestrian detour locations around staging sites in accordance with the Manual on Uniform Traffic Control Devices "work zone" guidance, and other applicable local and state requirements.
- Coordinating work plans and traffic control measures with emergency responders to prevent effects to emergency response times.
- Metro would develop a Construction Mitigation Program during final design and implement during construction. The Program would guide Metro in communicating to the community and obtaining input from residents and businesses affected during construction. This would include communicating traffic control measures, schedule of activities and duration of operations.

6.3.2 Indirect Impacts

6.3.2.1 Community and Neighborhood Impacts

The mitigation measures in Section 6.3.1.3 would address potential indirect community and neighborhood construction impacts. Implementation of these proposed mitigation measures would result in no indirect adverse impacts from the proposed alternative.

6.3.2.2 Geotechnical/Subsurface/Seismic/Hazardous Materials

During construction of the At-Grade Emphasis LRT Alternative, gaps between the tunnel and the surrounding earth could serve as preferential pathways for the migration of groundwater contamination. Specifications for impermeable grouting materials to fill the gap between the tunnel and the surrounding earth would be designed to reduce this potential impact.

- During construction of the underground portion of the At-Grade Emphasis LRT Alternative, mitigation would be required to address the potential for the creation of a preferential pathway and resulting spread of existing groundwater contamination. This could entail the use of impermeable grout where necessary to fill the gap between the

tunnel and the surrounding earth along underground portions of the alignment where groundwater contamination exists.

6.3.3 Cumulative Impacts

6.3.3.1 Traffic Circulation and Parking

The mitigation measures in Section 6.3.1.1 would address potential cumulative traffic circulation and parking construction impacts. After implementation of these proposed mitigation measures, a potential significant and unavoidable traffic circulation impact would remain during construction of the At-Grade Emphasis LRT Alternative.

6.3.3.2 Air Quality

The mitigation measures in Section 6.3.1.5 would address potential cumulative air quality construction impacts. After implementation of these proposed mitigation measures, a potential significant and unavoidable construction air quality impact would remain under the At-Grade Emphasis LRT Alternative.

6.4 Underground Emphasis LRT Alternative

6.4.1 Direct Impacts

6.4.1.1 Traffic Circulation and Parking

Refer to mitigation measures in Section 6.3.1.1. After implementation of these proposed mitigation measures, a potential significant and unavoidable traffic circulation impact would remain during construction of the Underground Emphasis LRT Alternative.

6.4.1.2 Displacements and Relocation

Refer to mitigation measures in Section 6.3.1.2. After implementation of these proposed mitigation measures, a potential less-than-significant impact from displacements and relocation would occur during construction of the Underground Emphasis LRT Alternative.

6.4.1.3 Community and Neighborhood Impacts

Refer to mitigation measures in Section 6.3.1.3. After implementation of these proposed mitigation measures, a potential less-than-significant community and neighborhood impact would occur during construction of the Underground Emphasis LRT Alternative.

6.4.1.4 Visual Resources and Aesthetics

Refer to mitigation measures in Section 6.3.1.4. After implementation of these proposed mitigation measures, a less-than-significant impact to visual resources and aesthetics would occur during construction of the Underground Emphasis LRT Alternative.

6.4.1.5 Air Quality

Refer to mitigation measures in Section 6.3.1.5. After implementation of these proposed mitigation measures, a potential significant and unavoidable construction air quality impact would occur under the Underground Emphasis LRT Alternative.

6.4.1.6 Noise and Vibration

Refer to mitigation measures in Section 6.3.1.6. After implementation of these proposed mitigation measures, a potential less-than-significant impact to noise and vibration would occur during construction of the Underground Emphasis LRT Alternative.

6.4.1.7 Geotechnical/Subsurface/Seismic/Hazardous Materials

Refer to mitigation measures in Section 6.3.1.7. After implementation of these proposed mitigation measures, a potential less-than-significant geotechnical, subsurface, seismic, and hazardous materials impact would occur during construction of the Underground Emphasis LRT Alternative.

6.4.1.8 Water Resources

Refer to mitigation measures in Section 6.3.1.8. After implementation of these proposed mitigation measures, a potential less-than-significant impact to water resources would occur during construction of the Underground Emphasis LRT Alternative.

6.4.1.9 Cultural/Archeological

Refer to mitigation measures in Section 6.3.1.9. After implementation of these proposed mitigation measures, a potential less-than-significant impact to cultural/archeological resources would occur during construction of the Underground Emphasis LRT Alternative.

6.4.1.10 Paleontological Resources

Refer to mitigation measures in Section 6.3.1.10. Mitigation measures would not be feasible in areas where tunnels would be constructed using TBMs. Potential impacts in these areas would be unavoidable. Despite implementation of proposed mitigation measures where possible, potentially significant impacts to paleontological resources could occur during construction of the Underground Emphasis LRT Alternative.

6.4.1.11 Ecosystems and Biological Resources

Refer to mitigation measures in Section 6.3.1.11. After implementation of these proposed mitigation measures, a potential less-than-significant impact to ecosystems and biological resources would occur during construction of the Underground Emphasis LRT Alternative.

6.4.1.12 Parklands, Community Facilities, and Section 4(f)

Refer to mitigation measures in Section 6.3.1.12. After implementation of these proposed mitigation measures, a potential less-than-significant impact to parklands, community facilities, and Section 4(f) resources would occur during construction of the Underground Emphasis LRT Alternative.

6.4.1.13 Economic and Fiscal

Refer to mitigation measures in Section 6.3.1.13. After implementation of these proposed mitigation measures, a potential less than significant economic and fiscal impact would occur during construction of the Underground Emphasis LRT Alternative.

6.4.1.14 Safety and Security

Refer to mitigation measures in Section 6.3.1.14. After implementation of these proposed mitigation measures, a potential less-than-significant impact to safety and security would occur during construction of the Underground Emphasis LRT Alternative.

6.4.2 Indirect Impacts

6.4.2.1 Community and Neighborhood Impacts

Refer to Section 6.3.1.3 for mitigation measures regarding community and neighborhood impacts. Implementation of these proposed mitigation measures would result in no indirect adverse construction impacts.

6.4.2.2 Geotechnical/Subsurface/Seismic/Hazardous Materials

Refer to Section 6.3.1.7 for mitigation measures regarding community and neighborhood impacts. Implementation of these proposed mitigation measures would result in no indirect adverse construction impacts.

6.4.3 Cumulative Impacts

6.4.3.1 Traffic Circulation and Parking

Refer to mitigation measures in Section 6.3.1.1. After implementation of these proposed mitigation measures, a potential significant and unavoidable traffic circulation impact would remain during construction of the Underground Emphasis LRT Alternative.

6.4.3.2 Air Quality

Refer to mitigation measures in Section 6.3.1.5. After implementation of these proposed mitigation measures, a potential significant and unavoidable construction air quality impact would remain under the Underground Emphasis LRT Alternative.

6.5 Fully Underground LRT Alternative – Little Tokyo Variation 1

6.5.1 Direct Impacts

6.5.1.1 Traffic Circulation and Parking

Potential adverse impacts associated with traffic circulation are anticipated during the construction of the Fully Underground LRT Alternative – Variation 1. Refer to Section 6.3.1.1 for mitigation measures regarding traffic circulation impacts. After implementation of these proposed mitigation measures, a potential significant and unavoidable adverse impact would remain during construction of the Fully Underground LRT Alternative – Variation 1.

6.5.1.2 Displacements and Relocation

Refer to mitigation measures in Section 6.3.1.2. After implementation of these proposed mitigation measures, a potential less-than-significant impact from displacements and relocation would occur during construction of the Fully Underground LRT Alternative – Variation 1.

6.5.1.3 Community and Neighborhood Impacts

Refer to mitigation measures in Section 6.3.1.3. After implementation of these proposed mitigation measures, a potential less than significant community and neighborhood impact would occur during construction of the Fully Underground LRT Alternative – Variation 1.

6.5.1.4 Visual Resources and Aesthetics

Refer to mitigation measures in Section 6.3.1.4. After implementation of these proposed mitigation measures, a potential less-than-significant impact to visual resources and aesthetics would occur during construction of the Fully Underground LRT Alternative – Variation 1.

6.5.1.5 Air Quality

Refer to mitigation measures in Section 6.3.1.5. After implementation of these proposed mitigation measures, a potential significant and unavoidable construction air quality impact would occur under the Fully Underground LRT Alternative – Variation 1.

6.5.1.6 Noise and Vibration

Refer to mitigation measures in Section 6.3.1.6. After implementation of these proposed mitigation measures, a potential less-than-significant impact to noise and vibration would occur during construction of the Fully Underground LRT Alternative – Variation 1.

6.5.1.7 Geotechnical/Subsurface/Seismic/Hazardous Materials

Refer to mitigation measures in Section 6.3.1.7. After implementation of these proposed mitigation measures, a potential less-than-significant impact to geotechnical /subsurface

/seismic /hazardous materials would occur during construction of the Fully Underground LRT Alternative – Variation 1.

6.5.1.8 Water Resources

Refer to mitigation measures in Section 6.3.1.8. After implementation of these proposed mitigation measures, a potential less-than-significant impact to water resources would occur during construction of the Fully Underground LRT Alternative – Variation 1.

6.5.1.9 Cultural/Archeological

Refer to mitigation measures in Section 6.3.1.9. After implementation of these proposed mitigation measures, a potential less-than-significant impact to cultural/archeological resources would occur during construction of the Fully Underground LRT Alternative – Variation 1.

6.5.1.10 Paleontological Resources

Refer to mitigation measures in Section 6.3.1.10. Mitigation measures would not be feasible in areas where tunnels would be constructed using TBMs. Potential impacts in these areas would be unavoidable. Despite implementation of proposed mitigation measures where possible, potentially significant impacts to paleontological resources could occur during construction of the Fully Underground LRT Alternative – Variation 1.

6.5.1.11 Ecosystems and Biological Resources

Refer to mitigation measures in Section 6.3.1.11. After implementation of these proposed mitigation measures, a potential less-than-significant impact to ecosystems and biological resources would occur during construction of the Fully Underground LRT Alternative – Variation 1.

6.5.1.12 Parklands, Community Facilities, and Section 4(f)

Refer to mitigation measures in Section 6.3.1.12. After implementation of these proposed mitigation measures, a potential less-than-significant impact to parklands, community facilities, and Section 4(f) resources would occur during construction of the Fully Underground LRT Alternative – Variation 1.

6.5.1.13 Economic and Fiscal

Refer to mitigation measures in Section 6.3.1.13. After implementation of these proposed mitigation measures, a potential less than significant economic and fiscal impact would occur during construction of the Fully Underground LRT Alternative – Variation 1.

6.5.1.14 Safety and Security

Refer to mitigation measures in Section 6.3.1.14. After implementation of these proposed mitigation measures, a potential less-than-significant impact to safety and security would occur during construction of the Fully Underground LRT Alternative – Variation 1.

6.5.2 Indirect Impacts

6.5.2.1 Community and Neighborhood Impacts

Refer to Section 6.3.1.3 for mitigation measures regarding community and neighborhood impacts. Implementation of these proposed mitigation measures would result in no indirect adverse construction impacts.

6.5.2.2 Geotechnical/Subsurface/Seismic/Hazardous Materials

Refer to Section 6.3.1.7 for mitigation measures regarding community and neighborhood impacts. Implementation of these proposed mitigation measures would result in no indirect adverse construction impacts.

6.5.3 Cumulative Impacts

6.5.3.1 Traffic Circulation and Parking

Refer to mitigation measures in Section 6.3.1.1. After implementation of these proposed mitigation measures, a potential significant and unavoidable traffic circulation impact would remain during construction of the Fully Underground LRT Alternative – Variation 1.

6.5.3.2 Air Quality

Refer to mitigation measures in Section 6.3.1.5. After implementation of these proposed mitigation measures, a potential significant and unavoidable construction air quality impact would remain under the Fully Underground LRT Alternative – Variation 1.

6.6 Fully Underground LRT Alternative – Little Tokyo Variation 2

6.6.1 Direct Impacts

6.6.1.1 Traffic Circulation and Parking

Potential adverse impacts associated with traffic circulation are anticipated during the construction of the Fully Underground LRT Alternative – Variation 2. Refer to Section 6.3.1.1 for mitigation measures regarding traffic circulation and parking impacts. After implementation of these proposed mitigation measures, a potential significant and unavoidable adverse impact would remain during construction of the Fully Underground LRT Alternative – Variation 2.

6.6.1.2 Displacements and Relocation

Refer to mitigation measures in Section 6.3.1.2. After implementation of these proposed mitigation measures, a potential less-than-significant impact from displacements and relocation would occur during construction of the Fully Underground LRT Alternative – Variation 2.

6.6.1.3 Community and Neighborhood Impacts

Refer to mitigation measures in Section 6.3.1.3. After implementation of these proposed mitigation measures, a potential less than significant community and neighborhood impact would occur during construction of the Fully Underground LRT Alternative – Variation 2.

6.6.1.4 Visual Resources and Aesthetics

Refer to mitigation measures in Section 6.3.1.4. After implementation of these proposed mitigation measures, a potential less-than-significant impact to visual resources and aesthetics would occur during construction of the Fully Underground LRT Alternative – Variation 2.

6.6.1.5 Air Quality

Refer to mitigation measures in Section 6.3.1.5. After implementation of these proposed mitigation measures, a potential significant and unavoidable construction air quality impact would occur under the Fully Underground LRT Alternative – Variation 2.

6.6.1.6 Noise and Vibration

Refer to mitigation measures in Section 6.3.1.6. After implementation of these proposed mitigation measures, a potential less-than-significant impact to noise and vibration would occur during construction of the Fully Underground LRT Alternative – Variation 2.

6.6.1.7 Geotechnical/Subsurface/Seismic/Hazardous Materials

Refer to mitigation measures in Section 6.3.1.7. After implementation of these proposed mitigation measures, a potential less-than-significant geotechnical, subsurface, seismic, and hazardous materials impact would occur during construction of the Fully Underground LRT Alternative – Variation 2.

6.6.1.8 Water Resources

Refer to mitigation measures in Section 6.3.1.8. After implementation of these proposed mitigation measures, a potential less-than-significant impact to water resources would occur during construction of the Fully Underground LRT Alternative – Variation 2.

6.6.1.9 Cultural/Archeological

Refer to mitigation measures in Section 6.3.1.9. After implementation of these proposed mitigation measures, a potential less-than-significant impact to cultural/archeological resources would occur during construction of the Fully Underground LRT Alternative – Variation 2.

6.6.1.10 Paleontological Resources

Refer to mitigation measures in Section 6.3.1.10. Mitigation measures would not be feasible in areas where tunnels would be constructed using TBMs. Potential impacts in these areas would be unavoidable. Despite implementation of proposed mitigation measures where possible, potentially significant impacts to paleontological resources could occur during construction of the Fully Underground LRT Alternative – Variation 2.

6.6.1.11 Ecosystems and Biological Resources

Refer to mitigation measures in Section 6.3.1.11. After implementation of these proposed mitigation measures, a potential less-than-significant impact to ecosystems and biological resources would occur during construction of the Fully Underground LRT Alternative – Variation 2.

6.6.1.12 Parklands, Community Facilities, and Section 4(f)

Refer to mitigation measures in Section 6.3.1.12. After implementation of these proposed mitigation measures, a potential less-than-significant impact to parklands, community facilities, and Section 4(f) resources would occur during construction of the Fully Underground LRT Alternative – Variation 2.

6.6.1.13 Economic and Fiscal

Refer to mitigation measures in Section 6.3.1.13. After implementation of these proposed mitigation measures, a potential less than significant economic and fiscal impact would occur during construction of the Fully Underground LRT Alternative – Variation 2.

6.6.1.14 Safety and Security

Refer to mitigation measures in Section 6.3.1.14. After implementation of these proposed mitigation measures, a potential less-than-significant impact to safety and security would occur during construction of the Fully Underground LRT Alternative – Variation 2.

6.6.2 Indirect Impacts

6.6.2.1 Community and Neighborhood Impacts

Refer to Section 6.3.1.3 for mitigation measures regarding community and neighborhood impacts. Implementation of these proposed mitigation measures would result in no indirect adverse construction impacts.

6.6.2.2 Geotechnical/Subsurface/Seismic/Hazardous Materials

Refer to Section 6.3.1.7 for mitigation measures regarding community and neighborhood impacts. Implementation of these proposed mitigation measures would result in no indirect adverse construction impacts.

6.6.3 Cumulative Impacts

6.6.3.1 Traffic Circulation and Parking

Refer to mitigation measures in Section 6.3.1.1. After implementation of these proposed mitigation measures, a potential significant and unavoidable traffic circulation impact would remain during construction of the Fully Underground LRT Alternative – Variation 2.

6.6.3.2 Air Quality

Refer to mitigation measures in Section 6.3.1.5. After implementation of these proposed mitigation measures, a potential significant and unavoidable construction air quality impact would remain under the Fully Underground LRT Alternative – Variation 2.

7.0 CONCLUSIONS

7.1 No Build Alternative

7.1.1 NEPA Findings

The No Build Alternative would not result in construction related impacts. Therefore, no significant adverse impacts are anticipated, and no mitigation measures would be required.

7.1.2 CEQA Determinations

Based on the CEQA thresholds of significance, the No Build Alternative would not have significant construction impacts. No cumulative considerable impacts are anticipated. Therefore, no mitigation measures would be required.

7.2 Transportation Systems Management (TSM) Alternative

7.2.1 NEPA Findings

The TSM Alternative would not result in construction related impacts. Therefore, no significant adverse impacts are anticipated, and no mitigation measures would be required.

7.2.2 CEQA Determinations

Based on the CEQA thresholds of significance, the TSM Alternative would not have significant impacts during construction. No cumulative considerable impacts are anticipated. Therefore, no mitigation measures would be required.

7.3 At-Grade Emphasis LRT Alternative

Table 7-1 shows a summary of potential impacts by topic during construction of the At-Grade Emphasis LRT Alternative.

7.3.1 NEPA Findings

The At-Grade Emphasis LRT Alternative would have potentially adverse construction impacts related to following environmental topics:

- Traffic Circulation
- Displacements and Relocation
- Air Quality
- Noise and Vibration

- Community and Neighborhood Impacts
- Geotechnical/Subsurface/Seismic/Hazardous Materials
- Cultural/Archeological Resources
- Paleontological Resources
- Water Resources
- Economic and Fiscal Resources
- Ecosystems and Biological Resources

Potential mitigation measures would reduce these impacts to less than significant other than to air quality and traffic circulation. Implementation of mitigation measures would result in no direct, indirect, or cumulative adverse construction impacts other than to air quality and traffic circulation. Unavoidable adverse air quality and traffic circulation impacts are anticipated during construction.

Table 7-1. Summary of Construction Impacts for the At-Grade Emphasis LRT Alternative

Topic	Impact Determination	Mitigation	Impact After Mitigation
Traffic circulation	Potentially Adverse	Yes	Potentially Adverse
Land Use & Development	Not Adverse	No	Not Adverse
Displacement & Relocation	Potentially Adverse, two temporary construction easements	Yes	Not Adverse
Community & Neighborhood Impacts	Potentially Adverse, mobility and access reduced (NEPA Only)	Yes	Not Adverse
Visual Resources & Aesthetics	Not Adverse	Yes	Not Adverse
Air Quality	Potentially Adverse	Yes	Potentially Adverse for VOC, NO_x, and CO
Noise & Vibration	Potentially Adverse	Yes	Not Adverse

Table 7-1. Summary of Construction Impacts for the At-Grade Emphasis LRT Alternative

Topic	Impact Determination	Mitigation	Impact After Mitigation
Ecosystems/Biological Resources	Potentially Adverse	No	Not Adverse
Geotechnical/Subsurface/ Seismic/Hazardous Materials	Potentially Adverse, seismically induced settlement, exposure to hazardous materials	Yes	Not Adverse
Water Resources	Potentially Adverse, erosion, groundwater contamination	Yes	Not Adverse
Energy	Not Adverse	No	Not Adverse
Climate Change	Not Adverse	No	Not Adverse
Cultural- Archeological Resources	Potentially Adverse	Yes	Not Adverse
Paleontological	Potentially Adverse	Yes	Not Adverse
Parklands, Community Facilities & Section 4(f)	Potentially Adverse, reduction of access	Yes	Not Adverse
Economic & Fiscal	Potentially Adverse	Yes	Not Adverse
Safety & Security	Not Adverse	Yes	Not Adverse
Growth-Inducing Impacts	Not Adverse	No	Not Adverse

Source: TAHA, 2010.

7.3.2 CEQA Determinations

Based on the CEQA thresholds of significance, the At-Grade Emphasis LRT Alternative would have potentially significant construction impacts related to the following environmental topics:

- Traffic Circulation
- Displacements and Relocation
- Air Quality

- Noise and Vibration
- Geotechnical/Subsurface/Seismic/Hazardous Materials
- Cultural/Archeological Resources
- Paleontological Resources
- Water Resources
- Economic and Fiscal Resources
- Ecosystems and Biological Resources
- Parklands and Other Community Facilities

Significant and unavoidable air quality and traffic circulation construction impacts are anticipated after mitigation. Potential mitigation measures would reduce all other direct, indirect, and cumulative construction impacts to less than significant levels.

7.4 Underground Emphasis LRT Alternative

Table 7-2 shows a summary of impacts by topic during construction of the Underground Emphasis LRT Alternative.

7.4.1 NEPA Findings

The Underground Emphasis LRT Alternative would have potentially adverse construction impacts related to following environmental topics:

- Traffic Circulation
- Displacements and Relocation
- Air Quality
- Noise and Vibration
- Community and Neighborhood Impacts
- Ecosystems/Biological Resources
- Geotechnical/Subsurface/Seismic/Hazardous Materials
- Water Resources

- Cultural/Archeological Resources
- Paleontological Resources
- Economic and Fiscal Resources
- Ecosystems and Biological Resources
- Parklands and Other Community Facilities

Unavoidable adverse air quality and traffic circulation construction impacts are anticipated to remain after mitigation. Potential mitigation measures would all other potential direct, indirect, and cumulative construction impacts to less than significant levels.

Table 7-2. Summary of Construction Impacts for the Underground Emphasis LRT Alternative

Topic	Impact Determination	Mitigation	Impact After Mitigation
Traffic circulation	Potentially Adverse	Yes	Potentially Adverse
Land Use & Development	Not Adverse	No	Not Adverse
Displacement & Relocation	Potentially Adverse, eight temporary construction easements	Yes	Not Adverse
Community & Neighborhood Impacts	Potentially Adverse, mobility and access reduced (NEPA Only)	Yes	Not Adverse
Visual Resources & Aesthetics	Not Adverse	Yes	Not Adverse
Air Quality	Potentially Adverse	Yes	Potentially Adverse for VOC, NO_x, and CO
Noise & Vibration	Potentially Adverse	Yes	Not Adverse
Ecosystems/Biological Resources	Potentially Adverse	No	Not Adverse
Geotechnical/Subsurface/ Seismic/Hazardous Materials	Potentially Adverse, seismically induced settlement, exposure to hazardous materials	Yes	Not Adverse

Table 7-2. Summary of Construction Impacts for the Underground Emphasis LRT Alternative			
Topic	**Impact Determination**	**Mitigation**	**Impact After Mitigation**
Water Resources	Potentially Adverse, erosion, groundwater contamination	Yes	Not Adverse
Energy	Not Adverse	No	Not Adverse
Climate Change	Not Adverse	No	Not Adverse
Cultural/Archeological Resources-	Potentially Adverse	Yes	Not Adverse
Paleontological	Potentially Adverse	Yes	Potentially Adverse (CEQA Only)
Parklands, Community Facilities & Section 4(f)	Potentially Adverse, reduced access	Yes	Not Adverse
Economic & Fiscal	Potentially Adverse	Yes	Not Adverse
Safety & Security	Not Adverse	Yes	Not Adverse
Growth-Inducing Impacts	Not Adverse	No	Not Adverse

Source: TAHA, 2010.

7.4.2 CEQA Findings

Based on the CEQA thresholds of significance, the Underground Emphasis LRT Alternative would have potentially significant construction impacts related to the following topics:

- Traffic Circulation
- Displacements and Relocation
- Air Quality
- Noise and Vibration
- Geotechnical/Subsurface/Seismic/Hazardous Materials
- Cultural/Archeological Resources

- Paleontological Resources
- Water Resources
- Economic and Fiscal Impacts
- Ecosystems and Biological Resources
- Parklands and Other Community Facilities

Significant and unavoidable paleontology, air quality and traffic circulation construction impacts are anticipated to remain after mitigation. Potential mitigation measures would reduce all other potential direct, indirect, and cumulative construction impacts to less than significant levels.

7.5 Fully Underground LRT Alternative – Little Tokyo Variation 1

Table 7-3 shows a summary of impacts by topic during construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1.

Table 7-3. Summary of Construction Impacts for the Fully Underground LRT Alternative – Little Tokyo Variation 1

Topic	Impact Determination	Mitigation	Impact After Mitigation
Traffic circulation	Potentially Adverse	Yes	Potentially Adverse
Land Use & Development	Not Adverse	No	Not Adverse
Displacement & Relocation	Potentially Adverse, five temporary construction easements	Yes	Not Adverse
Community & Neighborhood Impacts	Potentially Adverse, mobility and access reduced (NEPA Only)	Yes	Not Adverse
Visual Resources & Aesthetics	Not Adverse	Yes	Not Adverse
Air Quality	Potentially Adverse	Yes	Potentially Adverse for VOC, NO_x, and CO
Noise & Vibration	Potentially Adverse	Yes	Not Adverse

Table 7-3. Summary of Construction Impacts for the Fully Underground LRT Alternative – Little Tokyo Variation 1			
Topic	**Impact Determination**	**Mitigation**	**Impact After Mitigation**
Ecosystems/Biological Resources	Potentially Adverse	No	Not Adverse
Geotechnical/Subsurface/ Seismic/Hazardous Materials	Potentially Adverse, seismically induced settlement, exposure to hazardous materials	Yes	Not Adverse
Water Resources	Potentially Adverse, erosion, groundwater contamination	Yes	Not Adverse
Energy	Not Adverse	No	Not Adverse
Climate Change	Not Adverse	No	Not Adverse
Cultural/Archeological Resources	Potentially Adverse	Yes	Not Adverse
Paleontological	Potentially Adverse	Yes	Potentially Adverse (CEQA Only)
Parklands, Community Facilities & Section 4(f)	Potentially Adverse, reduced access	Yes	Not Adverse
Economic & Fiscal	Potentially Adverse	Yes	Not Adverse
Safety & Security	Not Adverse	Yes	Not Adverse
Growth-Inducing Impacts	Not Adverse	No	Not Adverse

Source: TAHA, 2010.

7.5.1 NEPA Findings

The Fully Underground LRT Alternative – Little Tokyo Variation 1 would have potentially adverse construction impacts related to following environmental topics:

- Traffic Circulation
- Displacements and Relocation

- Air Quality
- Noise and Vibration
- Community and Neighborhood Impacts
- Ecosystems/Biological Resources
- Geotechnical/Subsurface/Seismic/Hazardous Materials
- Water Resources
- Cultural/Archeological Resources
- Paleontological Resources
- Economic and Fiscal Impacts
- Ecosystems and Biological Resources
- Parklands and Other Community Facilities

Unavoidable adverse air quality and traffic circulation construction impacts are anticipated to remain after mitigation. Potential mitigation measures would reduce all other potential direct, indirect, and cumulative construction impacts to less than significant levels.

7.5.2 CEQA Determinations

Based on the CEQA thresholds of significance, the Fully Underground LRT Alternative – Little Tokyo Variation 1 would have potentially significant construction impacts related to the following topics:

- Traffic Circulation
- Displacements and Relocation
- Air Quality
- Noise and Vibration
- Geotechnical/Subsurface/Seismic/Hazardous Materials
- Cultural/Archeological Resources
- Paleontological Resources

- Water Resources
- Economic and Fiscal Impacts
- Ecosystems and Biological Resources

Significant and unavoidable paleontology, air quality and traffic circulation construction impacts are anticipated to remain after mitigation. Potential mitigation measures would reduce all other potential direct, indirect, and cumulative construction impacts to less than significant levels.

7.6 Fully Underground LRT Alternative – Little Tokyo Variation 2

Table 7-4 shows a summary of impacts by topic during construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2.

Table 7-4. Summary of Construction Impacts for the Fully Underground LRT Alternative – Little Tokyo Variation 2

Topic	Impact Determination	Mitigation	Impact After Mitigation
Traffic Circulation	Potentially Adverse	Yes	Potentially Adverse
Land Use & Development	Not Adverse	No	Not Adverse
Displacement & Relocation	Potentially Adverse, five temporary construction easements	Yes	Not Adverse
Community & Neighborhood Impacts	Potentially Adverse, mobility and access reduced (NEPA Only)	Yes	Not Adverse
Visual Resources & Aesthetics	Not Adverse	Yes	Not Adverse
Air Quality	Potentially Adverse	Yes	Not Adverse
Noise & Vibration	Potentially Adverse	Yes	Not Adverse
Ecosystems/Biological Resources	Potentially Adverse	No	Not Adverse

Table 7-4. Summary of Construction Impacts for the Fully Underground LRT Alternative – Little Tokyo Variation 2

Topic	Impact Determination	Mitigation	Impact After Mitigation
Geotechnical/Subsurface/Seismic/Hazardous Materials	Potentially Adverse, seismically induced settlement, exposure to hazardous materials	Yes	Not Adverse
Water Resources	Potentially Adverse, erosion, groundwater contamination	Yes	Not Adverse
Energy	Not Adverse	No	Not Adverse
Climate Change	Not Adverse	No	Not Adverse
Cultural/Archeological	Potentially Adverse	Yes	Not Adverse
Paleontological	Potentially Adverse	Yes	Potentially Adverse (CEQA Only)
Parklands, Community Facilities & Section 4(f)	Potentially Adverse, reduced access	Yes	Not Adverse
Economic & Fiscal	Potentially Adverse	Yes	Not Adverse
Safey & Security	Not Adverse	Yes	Not Adverse
Growth-Inducing Impacts	Not Adverse	No	Not Adverse

Source: TAHA, 2010.

7.6.1 NEPA Findings

Fully Underground LRT Alternative – Little Tokyo Variation 2 would have potentially adverse construction impacts related to following environmental topics:

- Traffic Circulation
- Displacements and Relocation
- Air Quality

- Noise and Vibration
- Community and Neighborhood Impacts
- Ecosystems/Biological Resources
- Geotechnical/Subsurface/Seismic/Hazardous Materials
- Water Resources
- Cultural/Archeological Resources
- Paleontological Resources
- Economic and Fiscal Impacts
- Ecosystems and Biological Resources

Unavoidable adverse air quality and traffic circulation construction impacts are anticipated to remain after mitigation. Potential mitigation measures would reduce all other potential direct, indirect, and cumulative construction impacts to less than significant levels.

7.6.2 CEQA Determinations

Based on the CEQA thresholds of significance, the Fully Underground LRT Alternative – Little Tokyo Variation 2 would have potentially significant construction impacts related to the following topics:

- Traffic Circulation
- Displacements and Relocation
- Air Quality
- Noise and Vibration
- Geotechnical/Subsurface/Seismic/Hazardous Materials
- Cultural/Archeological Resources
- Paleontological Resources
- Water Resources
- Economic and Fiscal Impacts

- Ecosystems and Biological Resources

Significant and unavoidable paleontology, air quality and traffic circulation construction impacts are anticipated to remain after mitigation. Potential mitigation measures would reduce all other potential direct, indirect, and cumulative construction impacts to less than significant levels.

7.7 Comparison of Build Alternatives

Table 7-5 shows a comparison of impacts by Build Alternative during construction.

Table 7-5. Summary of Construction Impacts for the Build Alternatives (After Implementation of Mitigation Measures)

Topic	At-Grade Emphasis	Underground Emphasis	Underground - Little Tokyo Variation 1	Underground - Little Tokyo Variation 2
Traffic circulation	Potentially Adverse	Potentially Adverse	Potentially Adverse	Potentially Adverse
Land Use & Development	Not Adverse	Not Adverse	Not Adverse	Not Adverse
Displacement & Relocation	Not Adverse	Not Adverse	Not Adverse	Not Adverse
Community & Neighborhood Impacts	Not Adverse	Not Adverse	Not Adverse	Not Adverse
Visual Resources & Aesthetics	Not Adverse	Not Adverse	Not Adverse	Not Adverse
Air Quality	Potentially Adverse for VOC, NO_x, and CO	Potentially Adverse for VOC, NO_x, and CO	Potentially Adverse for VOC, NO_x, and CO	Potentially Adverse for VOC, NO_x, and CO
Noise & Vibration	Not Adverse	Not Adverse	Not Adverse	Not Adverse
Ecosystems/Biological Resources	Not Adverse	Not Adverse	Not Adverse	Not Adverse

Table 7-5. Summary of Construction Impacts for the Build Alternatives (After Implementation of Mitigation Measures)

Topic	At-Grade Emphasis	Underground Emphasis	Underground - Little Tokyo Variation 1	Underground - Little Tokyo Variation 2
Geotechnical/Subsurface/ Seismic/Hazardous Materials	Not Adverse	Not Adverse	Not Adverse	Not Adverse
Water Resources	Not Adverse	Not Adverse	Not Adverse	Not Adverse
Energy	Not Adverse	Not Adverse	Not Adverse	Not Adverse
Climate Change	Not Adverse	Not Adverse	Not Adverse	Not Adverse
Cultural/Archeological Resources-	Not Adverse	Not Adverse	Not Adverse	Not Adverse
Paleontological	Not Adverse	Potentially Adverse (CEQA)	Potentially Adverse (CEQA)	Potentially Adverse (CEQA)
Parklands, Community Facilities & Section 4(f)	Not Adverse	Not Adverse	Not Adverse	Not Adverse
Economic & Fiscal	Not Adverse	Not Adverse	Not Adverse	Not Adverse
Safety & Security	Not Adverse	Not Adverse	Not Adverse	Not Adverse
Growth-Inducing Impacts	Not Adverse	Not Adverse	Not Adverse	Not Adverse

Source: TAHA, 2010.

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