Regional Connector Transit Corridor

Draft Environmental Impact Statement/

Draft Environmental Impact Report

APPENDIX Q

AIR QUALITY IMPACTS AND HEALTH RISK ASSESSMENT

State Clearinghouse Number: 2009031043

Regional Connector Transit Corridor
Air Quality Impacts and Health Risk Assessment
Technical Memorandum

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Prepared for

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ACRONYMS

CAA – Clean Air Act

CAAQS – California Ambient Air Quality Standards

CARB – California Air Resources Board

CCAA – California Clean Air Act

CNG – Compressed Natural Gas

HARP – Hotspots Analysis Reporting Program

HIA – Acute Hazard Index

HIC – Chronic Hazard Index

LST – Localized Significance Thresholds

MICR – Maximum Individual Cancer Risk

MSAT – Mobile Source Air Toxics

NAAQS – National Ambient Air Quality Standards

RTIP – Regional Transportation Improvement Program

RTP – Regional Transportation Plan

SCAQMD – South Coast Air Quality Management District

SoCAB – South Coast Air Basin

SIP – State Implementation Plan

TAC – Toxic Air Contaminant

1.0 SUMMARY

This technical memorandum (memo) discusses the results of the proposed Regional Connector Transit Corridor project air quality impact analysis and health risk assessment. The analysis and assessment fulfill project impact disclosure requirements under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). This section summarizes potential impacts to air quality and inhalation health risks associated with the proposed construction and operation of the Regional Connector Transit Corridor project. The analysis includes the preparation of emissions inventories for construction and operations, health risk assessments for construction activities, and a carbon monoxide (CO) hot spots analysis.

This analysis discusses both criteria pollutants and toxic air contaminants (TACs). Criteria pollutants, which are regulated by human health-based permissible levels (hence, "criteria"), include six common pollutants: particulate matter (PM_{10} and $PM_{2.5}$), ozone (O_3)[1] (commonly known as "smog"), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and lead (Pb). A TAC is an air pollutant that can cause or contribute to an increase in mortality or serious illness or that 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 diesel particulate matter (DPM).

This memo discusses potential impacts from both construction activities and operations. For operations-related impacts, the analysis provides a comparison between the air quality conditions that currently exist without the proposed project (i.e., existing conditions in 2009)and air quality conditions projected to occur in the future with implementation of each alternative being considered for the proposed project (i.e., full implementation of each alternative in the future horizon year of 2035). The focus of the operations impact analysis is on the change in vehicle traffic, and associated air pollutant emissions, that would result from implementation of each alternative. While this type of direct comparison can help characterize how existing air quality conditions may be different in the future with implementation of the proposed project, it is not a true representation of the impacts directly attributable to the project. This is because background traffic conditions will change substantially between 2009 and 2035 due to regional population growth and development that is anticipated to occur irrespective of the Regional Connector Transit Corridor project. A more accurate and meaningful delineation of air quality impacts directly attributable to

[1] Ozone is a secondary pollutant, formed from "precursor compounds" - volatile organic compounds (VOCs) and oxides of nitrogen (NOx) - in the presence of sunlight. Because the formation of ozone is complex and difficult to assess on a project level, air quality impact analyses address ozone by analyzing emissions of NOx and VOC precursors instead.

project-related changes in traffic is achieved through a comparison of a proposed future alternative (2035) and the No Build Alternative (2035). In assessing the difference in vehicle-related air pollutant emissions for future conditions with and without the project, the amount of change was compared to thresholds of significance developed by the South Coast Air Quality Management District (SCAQMD) to evaluate project significance under CEQA. The increment between a proposed future alternative (2035) and the No Build Alternative (2035) was also compared against general conformity thresholds established in 40 CFR 51. A transportation conformity analysis was also completed.

1.1 Operational Emissions Results

Incremental daily operational emissions associated with each of the proposed alternatives above existing conditions are summarized in Table 1-1. For the reasons discussed in Section 1.0, this increment is provided for informational purposes only and is not intended to be the basis for any determination of significance. Rather, incremental daily operational emissions associated with each of the proposed alternatives above the No Build Alternative (2035) are summarized in Table 1-2 for CEQA. Incremental annual operational emissions associated with each of the proposed alternatives above the No Build Alternative are summarized in Table 1-3 for NEPA.

1.1.1 CEQA Analysis

A CEQA analysis typically evaluates project-related impacts measured against a "baseline" that is defined by the physical environmental conditions occurring at the time the EIR Notice of Preparation was published. In the case of the Regional Connector Transit Corridor project, the CEQA baseline year would be 2009. Based on the long-term regional nature of the proposed project, a horizon year of 2035 is used for characterizing the project's operational characteristics at full implementation. As such, the CEQA analysis completed for the Regional Connector Transit Corridor project includes a delineation of the emissions for the future project year (2035) as compared to those for existing conditions (2009); however, this increment is provided for informational purposes only.

Table 1-1 delineates the incremental increase in emissions associated with each alternative, as measured against the 2009 baseline year. Future emission levels will be affected primarily by regional growth and associated increases in vehicle travel that are projected to occur between 2009 and 2035, as evidenced by comparing each of the build alternatives to the No Build Alternative (i.e., the increased emissions associated with the No Build Alternative, as measured from the 2009 baseline year, reflect the emissions from regional growth and associated increases in background traffic). Despite the increase in vehicle miles traveled (VMT), improvements in engine technology are expected to reduce emission rates of several pollutants in future years, including VOCs, CO, and NOx. These reductions are shown in parentheses in Table 1-1.

PM_{10} and $PM_{2.5}$ emissions associated with re-entrained road dust, which consists of a mixture of brake wear and tire wear emissions, and the re-suspension of loose material on the road surface, are unaffected by engine technology. In addition, SO_2 emission rates are dependent on sulfur content of fuel. California already capped sulfur content of fuel at 15 parts per million (ppm) and is not expected to substantially reduce the cap in the future. Therefore, PM_{10}, $PM_{2.5}$, and SO_2 emission factors (in grams/mile) are expected to remain relatively flat from 2009 through 2035. The large increase in PM_{10}, $PM_{2.5}$, and SO_2 emissions reflects the magnitude of the study area that includes emissions from a four-county region (Los Angeles, Orange, Riverside, and San Bernardino Counties). In fact, regional population growth, which is predicted to cause an increase in vehicle miles traveled, and hence, an increase in engine exhaust emissions, between 2009 and 2035 would be the source of increased emissions of PM_{10}, $PM_{2.5}$, and SO_2.

Table 1-1. Incremental Daily Operational Emissions Compared to Baseline Year

Alternative	Incremental Emissions[1,2] (lbs/day)					
	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
No Build	(35,100)	(884,700)	(114,700)	2,900	200,300	53,900
TSM	(35,100)	(885,100)	(114,700)	2,800	200,100	53,900
At-Grade Emphasis	(35,100)	(885,200)	(114,800)	2,800	200,000	53,900
Underground Emphasis	(35,100)	(885,300)	(114,800)	2,800	200,000	53,900
Fully Underground[3]	(35,100)	(885,300)	(114,800)	2,800	200,000	53,900

Notes:
[1] Incremental emissions are determined by subtracting the given alternative emissions from the Baseline emissions.
[2] Emission reductions (beneficial impacts) are shown in parentheses.
[3] Emissions for Fully Underground LRT Alternative are the same for Variation 1 and Variation 2.

As noted above, the determination of significant impacts within the CEQA analysis of daily, traffic-related operational emissions is based on a comparison to the No Build Alternative, which accounts for regional growth and increases in background traffic that would occur independent of the project. Compared to the No Build Alternative, the daily incremental emissions associated with each action alternative would either decrease or remain unchanged for all pollutants under all alternatives; thus all operational emission impacts are less than significant under CEQA. Overall, vehicular travel would decrease as a result of the project. This result would be consistent with air quality goals in the region.

Table 1-2. Incremental Daily Operational Emissions Compared to the No Build Alternative (2035)

Alternative	Incremental Emissions[1,2] (lbs/day)					
	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
TSM	0	(400)	0	(100)	(200)	0
At-Grade Emphasis	0	(500)	(100)	(100)	(300)	0
Underground Emphasis	0	(600)	(100)	(100)	(300)	0
Fully Underground[3]	0	(600)	(100)	(100)	(300)	0
CEQA Threshold	55	550	55	150	150	55

Notes:
[1] Incremental emissions are determined by subtracting the given alternative emissions from the No Build Alternative emissions.
[2] Emission reductions (beneficial impacts) are shown in parentheses.
[3] Emissions for Fully Underground LRT Alternative are the same for Variation 1 and Variation 2.

1.1.2 NEPA Analysis

NEPA analysis requires comparing emissions for the future project year (2035) to those for the No Build Alternative (2035). Operational emissions of all project alternatives would be less than significant under the NEPA analysis. Each of the alternatives reduced highway VMT when compared to the No Build Alternative. The TSM Alternative, however, would result in additional compressed natural gas (CNG) bus emissions. NOx emissions would increase beyond the NEPA significance threshold under the TSM Alternative.

Table 1-3. Incremental Annual Operational Emissions Compared to No Build Alternative

Alternative	Incremental Emissions (tons per year)[1,2]					
	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
TSM	(2)	(85)	**16**	(1)	(43)	(7)
At-Grade Emphasis	(2)	(105)	(7)	(1)	(51)	(11)
Underground Emphasis	(2)	(109)	(7)	(1)	(53)	(12)
Fully Underground[3]	(2)	(112)	(7)	(1)	(55)	(12)
NEPA Threshold	10	100	10	100	70	100

*Note: Emissions greater than threshold of significance are shown in **bold**.*
Notes:
[1] *Incremental emissions are determined by subtracting the given alternative emissions from the No Build Alternative emissions.*
[2] *Emission reductions (beneficial impacts) are shown in parentheses.*
[3] *Emissions for the Fully Underground LRT Alternatives are the same for Variation 1 and Variation 2.*

1.1.3 CO Hot Spots

This memo evaluates the significance of localized concentrations of CO under the proposed project. The analysis used the methodology in the *Transportation Project-Level Carbon Monoxide Protocol* (CO Protocol) that was developed by the University of California Davis for the California Department of Transportation (Caltrans). A screening analysis was completed using Appendix A of the CO Protocol. It evaluated which street intersections under the project alternatives would contribute the most to adverse impacts to localized air quality.

This memo analyzes the five intersections with the most potential for adverse impacts using the CAL3QHC model. This is the Environmental Protection Agency's (EPA) preferred model for CO hot spots modeling. Concentrations of CO at the intersections would not exceed the California Ambient Air Quality Standards (CAAQS) or National Ambient Air Quality Standards (NAAQS). Thus, the CO hot spots would not be significant. The results of the analysis are provided in Table 1-4.

Table 1-4. Summary of CO Hot Spots Analysis (Localized Concentrations of CO)					
ID	Intersection	Max. CO Conc. (ppm)[1]		Significance	
		1-Hour	8-Hour	1-Hour[2]	8-Hour[3]
Existing Conditions (2009)					
5	1st Street and Main Street	4.20	3.17	no	no
12	2nd Street and Hill Street	3.90	2.96	no	no
57	Temple Street and Main Street	4.20	3.17	no	no
58	Temple Street and Los Angeles Street	4.20	3.17	no	no
60	Temple Street and Alameda Street	4.20	3.17	no	no
No Build Alternative (2035)					
5	1st Street and Main Street	1.40	1.04	no	no
12	2nd Street and Hill Street	1.30	0.97	no	no
57	Temple Street and Main Street	1.40	1.04	no	no
58	Temple Street and Los Angeles Street	1.30	0.97	no	no
60	Temple Street and Alameda Street	1.40	1.04	no	no
TSM Alternative (2035)					
5	1st Street and Main Street	1.40	1.04	no	no
12	2nd Street and Hill Street	1.30	0.97	no	no
57	Temple Street and Main Street	1.40	1.04	no	no
58	Temple Street and Los Angeles Street	1.30	0.97	no	no
60	Temple Street and Alameda Street	1.40	1.04	no	no

Table 1-4. Summary of CO Hot Spots Analysis (Localized Concentrations of CO)					
ID	Intersection	Max. CO Conc. (ppm)[1]		Significance	
		1-Hour	8-Hour	1-Hour[2]	8-Hour[3]
At-Grade Emphasis LRT Alternative (2035)					
5	1st Street and Main Street	1.40	1.04	no	no
12	2nd Street and Hill Street	1.30	0.97	no	no
57	Temple Street and Main Street	1.50	1.11	no	no
58	Temple Street and Los Angeles Street	1.30	0.97	no	no
60	Temple Street and Alameda Street	1.40	1.04	no	no
Underground Emphasis LRT Alternative (2035)					
5	1st Street and Main Street	1.40	1.04	no	no
12	2nd Street and Hill Street	1.30	0.97	no	no
57	Temple Street and Main Street	1.40	1.04	no	no
58	Temple Street and Los Angeles Street	1.40	1.04	no	no
60	Temple Street and Alameda Street	1.40	1.04	no	no
Fully Underground LRT Alternative (2035)					
5	1st Street and Main Street	1.40	1.04	no	no
12	2nd Street and Hill Street	1.30	0.97	no	no
57	Temple Street and Main Street	1.40	1.04	no	no
58	Temple Street and Los Angeles Street	1.40	1.04	no	no
60	Temple Street and Alameda Street	1.40	1.04	no	no

Notes:
[1] Maximum concentrations for a given year include the ambient background CO concentrations (1-hour and 8-hour) for that year.
[2] 1-Hour CAAQS = 9.0 ppm; 1-Hour NAAQS = 9 ppm
[3] 8-Hour CAAQS = 20 ppm; 8-Hour NAAQS = 35 ppm
[4] Intersection data do not change between the Fully Underground LRT Alternative Alternatives.

1.2 Construction Emission Results

This memo estimates potential construction emissions and compares them to thresholds of significance published by the SCAQMD. The SCAQMD also recommends that localized impacts be evaluated for significance. Thus, this section summarizes construction air quality impacts locally and regionally.

1.2.1 Regional Construction Emissions

Emissions from construction of the project are analyzed under CEQA. Thresholds of significance developed for CEQA were also used for the NEPA analysis, since CEQA requirements are at least as stringent as NEPA requirements. Construction emissions would not occur if not for the project, so baseline emissions are assumed to be zero. Short-term, peak, daily emissions of VOC, NOx, CO, and $PM_{2.5}$ would exceed thresholds of significance for CEQA under all build alternatives. In addition, emissions of PM_{10} would exceed thresholds of significance for CEQA for the At-Grade Emphasis LRT Alternative. Emissions are summarized in Table 1-5.

Table 1-5. Summary of Unmitigated Peak Daily Construction Emissions

Alternative	Unmitigated Peak Daily Construction Emissions (lbs/day)					
	VOC	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
At-Grade Emphasis LRT Alternative	289	2,175	1,150	4	151	126
Underground Emphasis LRT Alternative						
2nd/Hope Streets Station (SEM) + Broadway Station	308	2,336	1,249	4	111	89
2nd/Hope Streets Station (Cut & Cover) + Broadway Station	313	2,375	1,272	4	113	90

Table 1-5. Summary of Unmitigated Peak Daily Construction Emissions						
Alternative	Unmitigated Peak Daily Construction Emissions (lbs/day)					
	VOC	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
2nd/Hope Streets Station (SEM) + Los Angeles Street Station	**308**	**2,332**	**1,247**	4	110	**89**
2nd/Hope Streets Station (Cut & Cover) + Los Angeles Street Station	**313**	**2,371**	**1,270**	4	113	**90**
Fully Underground LRT Alternative – Little Tokyo Variation 1						
2nd/Hope Streets Station (SEM)	**376**	**2,699**	**1,542**	5	129	**102**
2nd/Hope Streets Station (Cut & Cover)	**386**	**2,777**	**1,593**	5	133	**105**
Fully Underground LRT Alternative – Little Tokyo Variation 2						
2nd/Hope Streets Station (SEM)	**376**	**2,698**	**1,545**	5	131	**102**
2nd/Hope Streets Station (Cut & Cover)	**386**	**2,777**	**1,597**	5	135	**105**
Threshold of Significance	75	100	550	150	150	55

*Note: Emissions greater than threshold of significance are shown in **bold**.*

Since emissions from construction would exceed thresholds of significance for CEQA, it would be necessary to mitigate emissions from off-road construction equipment. Significant emission levels would be exceeded even if construction contractors used the cleanest equipment technology available at the time of construction. However, such adverse impacts would end after project construction was completed.

1.2.2 SCAQMD Localized Significance Thresholds (LST)

In June 2003 (revised July 2008), the SCAQMD developed a methodology to evaluate localized construction impacts on air quality that would account for air dispersion. The SCAQMD developed localized significance thresholds (LSTs) for projects based on the project location, size (acreage), and distance to the nearest receptor. Look-up tables were published for NOx, CO, PM_{10}, and $PM_{2.5}$ for both construction and operational impacts.

Maximum daily emissions for each project construction activity, considering their locations, were compared to relevant LSTs. The comparison assumes a one acre site for each construction activity and a distance of 25 meters to the nearest sensitive receptor. This approach provides conservative results for the LST analysis. After mitigation measures, emissions of all pollutants would be less than LST thresholds. Thus, construction-related pollutant concentrations would not be significant.

1.3 Mitigation Measures

Emissions of VOC, NOx, CO, and $PM_{2.5}$ would exceed thresholds of significance for construction emissions under CEQA (see Table 1-5). It would be necessary to apply mitigation measures to reduce emissions of these pollutants. This study uses the same criteria for determining significance under CEQA and NEPA. Construction that used new equipment (model year 2014 or newer) would reduce emissions, but emissions of VOC, NOx, and CO would still remain significant (see Table 1-6).

After applying mitigation measures, emissions of PM_{10} (for the At-Grade Emphasis LRT Alternative) and $PM_{2.5}$ would be less than regional thresholds of significance, but emissions of NOx, VOC, and CO would still exceed relevant thresholds. All mitigation measures would be implemented to the maximum extent possible. Measures like installing catalytic convertors or diesel particulate filters would reduce NOx emissions but would not reduce emissions of VOC and CO. Thus, significant regional emission levels of VOC and CO would be unavoidable under all project alternatives.

Long-term benefits of the project would outweigh adverse impacts from emission levels that temporarily exceeded acceptable levels during construction. The proposed Regional Connector Transit Corridor project would improve transportation in the region, helping to remove vehicles from the region's roadways. Operational emissions for build alternatives would be less than baseline emissions for key criteria pollutants (VOC, CO, and NOx). The project build alternatives would improve air quality in the region.

Table 1-6. Summary of Maximum Daily Mitigated Construction Emissions (lbs/day)						
Alternative	Maximum Daily Construction Mitigated Emissions (lbs/day)					
	VOC	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
At-Grade Emphasis LRT Alternative	**119**	**432**	**908**	4	27	12
Underground Emphasis LRT Alternative						
2nd/Hope Streets Station (SEM) + Broadway Station	**144**	**473**	**978**	4	27	12
2nd/Hope Streets Station (Cut & Cover) + Broadway Station	**147**	**488**	**998**	4	28	12
2nd/Hope Streets Station (SEM) + Los Angeles Street Station	**144**	**469**	**977**	4	27	12
2nd/Hope Station (Cut & Cover) + Los Angeles Street Station	**146**	**485**	**997**	4	28	12
Fully Underground LRT Alternative – Little Tokyo Variation 1						
2nd/Hope Station (SEM)	**189**	**602**	**1,266**	5	35	16
2nd/Hope Station (Cut & Cover)	**193**	**626**	**1,304**	5	36	16
Fully Underground LRT Alternative – Little Tokyo Variation 2						
2nd/Hope Station (SEM)	**188**	**601**	**1,268**	5	37	16
2nd/Hope Station (Cut & Cover)	**193**	**626**	**1,307**	5	38	16
Threshold of Significance	75	100	550	150	150	55

Note: Emissions greater than threshold of significance are shown in ***bold****.*
Mitigated emissions are based on the assumption that new model year engines (2014 or newer) will be used in project construction equipment.

2.0 INTRODUCTION

Air basins are defined as areas that share similar geographical and meteorological conditions. The South Coast Air Basin (SoCAB) consists of Orange County and the urban portions of Los Angeles, Riverside, and San Bernardino Counties. The SoCAB is confined by the Pacific Ocean and the San Gabriel, San Bernardino, San Jacinto, and Santa Ana Mountains. Normally, temperature decreases with altitude. However, the SoCAB is marked by frequent temperature inversions, where the temperature at higher elevations is higher than at lower elevations.

Furthermore, the region has very low average traffic speeds. The combination of low traffic speeds, temperature inversions, and surrounding mountains, creates a situation where pollutants are readily trapped in the basin. Pollutants cannot easily disperse horizontally or vertically. These factors, along with high population and high reliance on the automobile, make air quality in the SoCAB among the worst in the nation.

The Regional Connector Transit Corridor project would ultimately decrease air pollution in the region by removing vehicles from the roads and increasing regional transportation from clean emission sources. Although the addition of electric vehicles would be expected to cause an increase in emissions at the source of fossil fuel-fired electricity generation (power plant), the emission reduction from the motor vehicles being taken off the road due to persons mode switching to transit outweighs the effect of increased emissions from fossil fuel-fired electricity generation; therefore, a net benefit remains for air quality. However, construction of the project could cause a temporary increase in air pollution and negatively impact air quality temporarily. Therefore, this memo evaluates the potential for adverse impacts from construction and operation of the proposed Regional Connector Transit Corridor project.

3.0 METHODOLOGY FOR IMPACT EVALUATION

This section describes the methodology for analyzing potential impacts to air quality and assessing potential health risks. Emissions from construction equipment and the generation of dust could negatively impact air quality. Conversely, the operation of mass transit systems would benefit air quality through reducing vehicle traffic.

3.1 Standards of Significance

3.1.1 NEPA Guidelines

Pursuant to the Clean Air Act, EPA has established NAAQS for six criteria pollutants that are considered harmful to public health and welfare; the primary NAAQS set limits with an adequate margin of safety to protect public health, whereas the secondary NAAQS set limits to protect public welfare from any known or anticipated adverse effects. A project is considered significant under NEPA if it causes or contributes to ambient air concentrations that exceed NAAQS. The EPA developed emission levels that identify major stationary sources in nonattainment areas (40 CFR 51.165). These levels are also used to define de minimis thresholds for general conformity evaluations (40 CFR 51.853). Potentially adverse impacts may occur if project emissions exceed these thresholds (see Table 3-1). If project emissions do not exceed these thresholds, it would indicate that the project would not cause or contribute to emission levels that exceed NAAQS; thus, emissions would not be significant under NEPA.

Table 3-1. Federal Thresholds

Pollutants	Emissions Increase
Volatile organic compounds (VOC)	10 tons per year
Oxides of nitrogen (NOx)	10 tons per year
Carbon monoxide (CO)	100 tons per year
Inhalable Particulate Matter (PM_{10})	70 tons per year
Fine Particulate Matter ($PM_{2.5}$)	100 tons per year

Source: EPA, 40 CFR 51, 2009.
Note: On August 27, 2009, the EPA proposed to approve a "bump-up" request to reclassify the South Coast Air Basin from severe-17 nonattainment to extreme nonattainment for ozone (74 FR 43654). When finalized, this action would reduce the threshold of significance from 25 tons per year to 10 tons per year for VOC and NOx.

This memo analyzes both short-term impacts of emissions during construction and long-term impacts associated with operations. The analysis considers the long-term effect of the project on local and regional traffic emissions.

For construction emissions, this memo uses CEQA thresholds of significance to analyze NEPA compliance because NEPA does not contain thresholds specific to construction. Since CEQA has stricter requirements than NEPA, this is a conservative assumption. Construction emission sources considered include trucks used to haul material and debris to and from the project sites, fugitive dust from tunneling, earthwork and storage piles, and construction worker vehicles traveling to and from the sites. This analysis used the construction activity summaries provided in the proposed project's Description of Construction to estimate construction activities, equipment, and associated emissions.

From an operational standpoint, incremental project emissions were determined for motor vehicles based on the change in VMT between each alternative and the No Build Alternative. Changes in VMT were determined by project traffic consultants for each alternative. VMT estimates include project impacts on individual automobile VMT as well as transit bus VMT. The analysis assumes that electric light rail transit (LRT) motors would not generate any local exhaust emissions.

Finally, the analysis looks at surface traffic intersections that would be altered by the project, either during construction or after project completion. The memo analyzes CO concentration impacts at five intersections. The analysis focuses on these intersections because they were estimated to have the highest potential CO concentrations. Transportation Conformity (40 CFR 93, Subpart A) requires localized concentrations ("hot spots") of pollutants be analyzed for CO, PM_{10}, and $PM_{2.5}$. Other pollutants are either reactive in the atmosphere (such as NOx) or dissipate rapidly (such as SO_2) and do not contribute to local concentrations. A quantitative analysis of PM_{10}/$PM_{2.5}$ is not required unless the project results in an increase in diesel vehicles, which is not the case for this project.

This analysis uses the same emissions models for both NEPA and CEQA analyses. The EPA approved the current California Air Resources Board (CARB) motor vehicle emissions model, EMFAC2007, for use in developing on-road motor vehicle emission inventories in California after April 18, 2008 (73 FR 3464). Recently, the EPA approved baseline and projected emissions inventories contained in the 2003 Air Quality Management Plan (AQMP) for the SoCAB (74 FR 10176) as part of the California State Implementation Plan (SIP). The 2003 AQMP used the CARB OFFROAD model to estimate emissions from construction equipment and other off-road mobile sources. Therefore, the current versions of EMFAC (EMFAC2007) and OFFROAD (OFFROAD2007) were used to estimate on-road and off-road mobile source emissions, respectively. The NEPA analysis was completed with limited air dispersion modeling (CO hot spot modeling only).

3.1.2 CEQA

3.1.2.1 Regional Criteria Pollutant Emissions

The SCAQMD is the agency most responsible for improving air quality in the SoCAB. The SCAQMD published CEQA significance thresholds for analyzing the significance of project air quality impacts in the *CEQA Air Quality Handbook* (SCAQMD 1993). Regular updates are published on the SCAQMD website (SCAQMD 2009). The City of Los Angeles has also published significance thresholds for CEQA in the *L.A. CEQA Thresholds Guide* (City of Los Angeles 2006). Since the most recent thresholds of significance published by the SCAQMD on its website were released in 2009, these thresholds supersede the City of Los Angeles thresholds; therefore, this analysis uses the most recent significance thresholds from the SCAQMD.

The SCAQMD developed significance thresholds for mass daily emission rates of criteria pollutants for both construction and operational sources. These thresholds are summarized in Table 3-2.

Project emissions for typical developments are usually defined as the difference between future project alternatives and existing conditions at the time the project NOP was published. However, that approach ignores the regional background growth in population, traffic, and transportation infrastructure that would occur between the NOP date and project build-out. Considering such growth is critical when determining future mitigation for transit projects designed to reduce traffic congestion and associated air quality impacts. Therefore, project emissions for this CEQA analysis are defined as the difference between a project alternative (2035) and the 2009 Baseline adjusted for regional growth that would occur by 2035. The emissions associated with this adjusted baseline are equivalent to those for the No Build Alternative (2035). Project emissions greater than thresholds for a given air pollutant would be considered significant under CEQA. Thresholds in Table 3-2 indicate the maximum emissions that would not be expected to cause a violation of an air quality standard and consequently are used as surrogates for the CAAQS.

Table 3-2. SCAQMD Mass Daily Thresholds		
Pollutant	**Construction**	**Operation**
Oxides of nitrogen (NOx)	100 lbs/day	55 lbs/day
Volatile organic compounds (VOC)	75 lbs/day	55 lbs/day
Inhalable particulate matter (PM_{10})	150 lbs/day	150 lbs/day
Fine particulate matter ($PM_{2.5}$)	55 lbs/day	55 lbs/day
Oxides of sulfur (SOx)	150 lbs/day	150 lbs/day
Carbon monoxide (CO)	550 lbs/day	550 lbs/day
Lead (Pb)	3 lbs/day	3 lbs/day

Source: SCAQMD, 2009.

3.1.2.2 Localized Significance Thresholds (LSTs)

The SCAQMD has developed thresholds for local air quality impacts from construction activity (SCAQMD 2003 and SCAQMD 2006). Localized significance thresholds (LSTs) are applicable to the following criteria pollutants: NOx, CO, inhalable particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$). LSTs are analogous to NAAQS and CAAQS (pollutant levels below LSTs necessarily do not violate NAAQS and CAAQs). LSTs consider ambient concentrations of pollutants for each source receptor area and distances to the nearest sensitive receptor. For PM_{10}, LSTs were based on SCAQMD Rule 403 – Fugitive Dust.

LST emission tables have been developed for project sizes up to 5 acres. Most construction sites could be partitioned into active areas less than or equal to 5 acres in size. If two active areas of 5 acres each were adjacent to each other (meaning there is a common boundary between them) then the LST value was reduced to one-half of the single 5-acre value.

Applying LST methodology reduces the need to conduct dispersion modeling of construction emissions. If construction emission rates were less than the LST thresholds, the analysis assumed that concentration impacts would not cause NAAQS or CAAQS to be exceeded. Even if a pollutant exceeds a LST, a significant impact could be avoided through mitigation measures. Furthermore, a detailed dispersion analysis could be conducted to quantify the predicted ambient air quality concentration.

3.1.2.3 Toxic Air Contaminants

The SCAQMD established thresholds of significance for both carcinogenic and non-carcinogenic TACs. A significant adverse health risk impact would occur if a project alternative would result in a:

- Maximum Incremental Cancer Risk ≥ 10 in 1 million, or
- Hazard Index ≥ 1.0 (project increment for either chronic or acute exposure)

3.1.3 FTA Guidance for Air Quality Conformity

Approval, funding, and implementation of Federal Highway Administration (FHWA) and Federal Transit Authority (FTA) projects are subject to transportation conformity regulations under the Clean Air Act. (40 CFR 93, Subpart A). The SoCAB is defined as a non-attainment area for O_3, PM_{10}, and $PM_{2.5}$. The SoCAB is defined as a maintenance area for CO and nitrogen dioxide (NO_2). If a potential project is included in a conforming Regional Transportation Plan (RTP) and Regional Transportation Improvement Program (RTIP), the project is already included in emission budgets developed for the region. Thus, a unique, regional analysis of project emissions would not be required. However, analysis regarding possible localized impacts is still required.

The Southern California Association of Governments (SCAG) adopted a 2008 RTP and 2008 RTIP. The FHWA/FTA approved and made a positive conformity determination in June 2008 for the RTP and January 2009 for the RTIP. The Regional Connector Transit Corridor project was included in the list of modeled projects for the Final 2008 RTP and RTIP. Therefore, it is assumed that the project was considered in the transportation conformity determination for the 2008 RTP and RTIP.

Since the Regional Connector Transit Corridor project is included in the Final 2008 RTP and RTIP, the following parameters were evaluated as part of the conformity determination as required by 40 CFR 93:

- §93.110 – The conformity determination must be based upon the most recent planning assumptions in force at the time the conformity analysis begins.
- §93.111 – The conformity determination must be based on the latest emission estimation model available, including EMFAC for California-based projects.
- §93.112 – Conformity must be determined according to the consultation procedures in 40 CFR 93; the Southern California Association of Governments (SCAG) will be consulted regarding this project.

- §93.114 – There must be a currently conforming transportation plan and currently conforming Transportation Improvement Program at the time of project approval.
- §93.115 – The project must come from a conforming plan and program.
- §93.116 – The project must not cause or contribute to any new localized CO, PM_{10}, and/or $PM_{2.5}$ violations or increase the frequency or severity of any existing CO, PM_{10}, and $PM_{2.5}$ violations.
- §93.117 – The project must comply with any PM_{10} and $PM_{2.5}$ control measures in the applicable SIP.

3.2 Area of Potential Impact

The area of potential impact must be sufficiently large to identify the location of the maximum exposed individual for health risk purposes. The zone of impact normally encompasses the area where a person would be subject to an added lifetime cancer risk of one in one million or greater ($\geq 1.0 \times 10^{-6}$). However, the project is expected to have a long-term beneficial impact on air quality and inhalation risk. The area of potential impact was limited to a one kilometer radius around each exposed excavation site, which, based on related experience, is a sufficient distance to encompass the zone of impact related to cancer risk. In addition, emissions were quantified for haul trucks, delivery trucks, and construction worker vehicle trips from the site to trip ends (landfills, material source locations, or construction worker homes).

3.3 Analysis Methodology

3.3.1 Construction Emissions

This memo analyzes construction emissions with the methodology developed by the SCAQMD in its *CEQA Air Quality Handbook* (1993). Fugitive dust and engine exhaust emissions were characterized into the following main categories:

- Grading and excavation
- Heavy-duty equipment on unpaved areas
- Paved road dust (haul/delivery trucks)
- Loading/unloading of trucks
- Vehicle trips (including construction worker commuting and haul/delivery trucks)

Although the analysis used the *CEQA Air Quality Handbook* to estimate emissions, several emission factors and calculation methods in the Handbook are outdated. Thus, the analysis used current versions of the EMFAC and OFFROAD models, to generate on- and off-road emission factors, respectively, instead of the mobile source emission factors established in the *CEQA Air Quality Handbook*. The analysis used the Midwest Research Institute (MRI) *Improvement of Specific Emission Factors* report as necessary to update the fugitive dust emission factors identified in the *CEQA Air Quality Handbook*. (MRI 1996)

The analysis used EPA's *Compilation of Air Pollutant Emission Factors* (AP-42) to estimate emissions from fugitive dust (EPA 1995).

Dust emissions and dirt track-out will be minimized through compliance with SCAQMD Rule 403. Although projects are required to follow all of the Best Available Control Measures described in the rule, several of the key measures applicable to this project are as follows:

- For cut and fill at large sites, pre-water with sprinklers or water trucks and allow time for penetration.
- Apply water or stabilizing agent in sufficient quantities to prevent the generation of visible dust plumes.
- Track-out shall not extend 25 feet or more in cumulative length from the point of origin from an active operation. All track-out from an active operation shall be removed at the conclusion of each workday or evening shift.

If the disturbed surface area is five acres or more, or if the daily import or export of bulk material is 100 cubic yards or more, then at least one of the following precautions must also be taken:

- Install a pad consisting of washed gravel (minimum-size: one inch) maintained in a clean condition to a depth of at least size inches and extending at least 30 feet wide and at least 50 feet long.
- Pave the surface extending at least 100 feet and at least 20 feet wide.
- Use a wheel shaker/wheel spreading device consisting of raise divides at least 24 feet long and 10 feet wide to remove bulk material from tires and vehicle undercarriages before vehicles exit the site.
- Install and use a wheel washing system to remove bulk material from tires and vehicle undercarriages before vehicles exit the site.

3.3.2 Operational Emissions

3.3.2.1 CO Hot Spots

The first step in an air dispersion analysis is the selection of an applicable model. Two models commonly used to assess CO concentrations at roadway intersections (CO hot spots) are CAL3QHC and CALINE4. The EPA's *Guideline on Air Quality Models* (40 CFR 51, Appendix W) recommends the use of CAL3QHC. CAL3QHC combines CALINE3 with a traffic model to calculate delays and queues that occur at signalized intersections. Recent Metro projects requiring NEPA and CEQA findings have relied on the CAL3QHC model for CO hot spots analysis, and this memo follows suit.

3.3.2.2 Regional Emissions

Regional emissions were calculated from projected VMT for each of the project alternatives. Regional VMT data for each alternative was developed by project traffic consultants. This report used the current EPA-approved version of EMFAC to develop emission factors for different vehicle classes. EMFAC was used to describe the on-road fleet mix (relative ratio of light duty automobiles and trucks) for Los Angeles County in each year of the analysis. Passenger vehicles are the basic unit of traffic for modeling purposes. Other types of regional vehicles use regional highways, and the model accounts for large trucks by lowering roadway capacity. Changes in usage of other types of vehicles are not expected to occur as a result of this project.

3.3.3 Health Risk Assessment

CEQA analysis typically includes a health risk assessment for sensitive receptors (e.g., residents, workers, school children) near the project site that are likely to be exposed to TACs emitted from project activities. Most TACs are categorized as organic emissions or inorganic (primarily particulate) emissions. Therefore, emissions of TACs are typically calculated by applying chemical-specific mass fractions (also called speciation profiles) to VOC or PM_{10} emission rates calculated for criteria pollutant emission inventories.

CARB has developed speciation profiles for a variety of sources including diesel and gasoline motor vehicles, off-road diesel and gasoline mobile equipment, and fugitive dust. This analysis uses speciation profiles with projected VOC and PM_{10} emission levels to determine TAC emissions for each alternative.

This analysis uses SCAQMD Rule 1401 to determine the TACs to be evaluated for risk. Rule 1401 contains requirements related to New Source Review of TACs. In addition to specifying the risk limits for carcinogens and non-carcinogens (i.e., pollutants with chronic or acute hazards), the rule defines the pollutants that the SCAQMD considers to be toxic. This study identified 25 TACs from the speciation profiles for mobile emission sources. Several common

TACs from mobile sources (engine exhaust) include benzene, 1,3- butadiene, formaldehyde, acrolein, and diesel particulate matter (DPM). The analysis calculates speciated emissions for exhaust, tire wear, brake wear, paved road dust, and construction dust.

3.3.3.1 Construction Health Risk Assessment

This memo analyzes short-term, construction-related TAC emissions to determine acute risk impacts to those nearby. The SCAQMD developed a tiered approach to assessing risk from exposure to TACs (SCAQMD 2005a and SCAQMD 2008b). The memo applies tier 1 analysis (a series of lookup tables) to the construction phase to determine if acute impacts may be significant. Tier 1 analysis predicted no acute health risks from project construction, so further analysis did not need to be completed.

3.3.3.2 Operational Health Risk Assessment

Although emissions of particulate matter are expected to increase in the future alternatives (2035) when compared to existing conditions (2009) (see Table 1-1), this increment should not be used as the basis for determinations of significance, as noted in Section 3.1.2.1. Rather, an adjusted CEQA increment that compares the difference between a future alternative with the No Build Alternative would be used to evaluate significance. As shown in Table 1-2, emissions of all pollutants will either be less than or equal to the adjusted CEQA baseline. Since there will be a net benefit to air quality for operational emissions, an operational health risk assessment was not completed.

4.0 AFFECTED ENVIRONMENT

This section describes the area of analysis and the regulatory and environmental setting for air quality.

4.1 Area of Analysis

The air quality area of analysis includes the four-county region covered by the SoCAB (all of Orange County and the urban, non-desert portions of Los Angeles, Riverside, and San Bernardino Counties).

4.1.1 Regulatory Setting

Federal, state and local government all share responsibility for air quality management. The Federal Clean Air Act (CAA) and the California Clean Air Act (CCAA) are the primary statutes that establish ambient air quality standards. They establish regulatory authorities to design and enforce air quality regulations.

4.1.1.1 Federal

The EPA is responsible for implementation of the CAA. The CAA was enacted in 1955 and has amended in 1963, 1965, 1967, 1970, 1977, 1990, and 1997. Under authority of the CAA, EPA established NAAQS for the following criteria pollutants: CO, Pb, NO_2, O_3, particulate matter (PM_{10} and $PM_{2.5}$), and SO_2.

Table 4-1 presents current NAAQS for criteria air pollutants. Ozone is a secondary pollutant, meaning that it is formed in the atmosphere from reactions of precursor compounds under certain conditions. Primary precursor compounds that lead to formation of O_3 include VOC and NOx. Fine particulate matter ($PM_{2.5}$) can be emitted directly from sources (engines) or can form in the atmosphere from precursor compounds. $PM_{2.5}$ precursor compounds in SCoAB include SOx, NOx, VOC, and ammonia.

The CAA specifies dates for achieving compliance with NAAQS and mandates that states submit and implement a SIP for local areas not meeting these standards. SIPs must include pollution control measures and demonstrate how standards will be met. The CAA identifies specific emission reduction goals for areas not meeting NAAQS. The act requires a demonstration of reasonable further progress toward attainment and provides additional sanctions for failure to attain or meet interim milestones.

The SoCAB is designated as a federal non-attainment area for O_3, PM_{10}, and $PM_{2.5}$. Non-attainment designations are classified into levels of severity based on the pollutant concentration levels. Pollution concentration levels determine the mandated attainment date.

In 1998, the EPA designated the SoCAB as an attainment/maintenance area for NO_2. NO_2 levels in SoCAB dropped below NAAQS in the early 1990s. The EPA designated SoCAB as a maintenance area for CO in 2007.

An attainment/maintenance designation means a pollutant is currently in attainment. It indicates measures included in the SIP will ensure that the NAAQS for a pollutant are not exceeded. Table 4-2 presents the attainment designation for each of the federal criteria air pollutants.

Table 4-1. National and California Ambient Air Quality Standards

Pollutant	Averaging Time	CAAQS	NAAQS Primary	NAAQS Secondary
Ozone (O_3)	1-Hour	0.09 ppm (180 µg/m^3)	NS	NS
	8-Hour	0.070 ppm (137 µg/m^3)	0.075 ppm (147 µg/m^3) [1]	Same as primary [2]
Inhalable particulate matter (PM_{10})	24-Hour	50 µg/m^3	150 µg/m^3	Same as primary
	Annual	20 µg/m^3	NS	NS
Fine particulate matter ($PM_{2.5}$)	24-Hour	No separate State standard	35 µg/m^3	Same as primary
	Annual	12 µg/m^3	15.0 µg/m^3	Same as primary
Carbon monoxide (CO)	8-Hour	9.0 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	NS
	1-Hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	NS
Nitrogen dioxide (NO_2)	Annual	0.030 ppm (57 µg/m^3)	0.053 ppm (100 µg/m^3)	Same as primary
	1-Hour	0.18 ppm (339 µg/m^3)	0.100 ppm (189 µg/m^3) [3]	NS

Table 4-1. National and California Ambient Air Quality Standards

Pollutant	Averaging Time	CAAQS	NAAQS Primary	NAAQS Secondary
Sulfur dioxide (SO_2)[4]	Annual	NS	0.030 ppm (80 μg/m^3)	NS
	24-Hour	0.04 ppm (105 μg/m^3)	0.14 ppm (365 μg/m^3)	NS
	3-Hour	NS	NS	0.5 ppm (1,300 μg/m^3)
	1-Hour	0.25 ppm (655 μg/m^3)	NS	NS
Lead (Pb) [5]	30-Day Average	1.5 μg/m^3	NS	NS
	Calendar Quarter	NS	1.5 μg/m^3	Same as primary
	Rolling 3-Month Average	NS	0.15 μg/m^3	Same as primary

Source: CARB 2008
Notes:
[1]On January 19, 2010, the EPA released a proposed rule to strengthen the 8-hour primary O_3 NAAQS to a level within the range of 0.060 to 0.070 parts per million by volume (ppmv).
[2]On January 19, 2010, the EPA proposed to establish a cumulative, seasonal secondary O_3 NAAQS within the range of 7 to 15 ppm-hours.
[3]On February 9, 2010, the EPA finalized a rule to supplement the current annual NO_2 standard by establishing a new 1-hour NO_2 standard at a level of 100 parts per billion (ppb), based on the 3-year average of the 98th percentile of the yearly distribution of the 1-hour daily maximum concentrations (75 FR 6474). For comparison, this would be more stringent than the current California 1-hour CAAQS of 180 ppbv. The final rule is effective on April 12, 2010.
[4]On December 8, 2009, the EPA proposed to establish a new one-hour primary SO_2 NAAQS within the range of 50 – 100 parts per billion by volume (ppbv), based on the 3-year average of the annual 99th percentile of one-hour daily maximum concentrations (74 FR 64810). The EPA also proposed to revoke the existing 24-hour and annual primary SO_2 NAAQS.
[5]On November 12, 2008, the EPA revised the primary lead standard to 0.15 μg/m^3 and revised the averaging period to a rolling 3-month period with a not-to-be-exceeded form, evaluated over a 3-year period (73 FR 66964).

Key:
NAAQS = National Ambient Air Quality Standard
CAAQS = California Ambient Air Quality Standard
ppm = parts per million
µg/m³ = micrograms per cubic meter
mg/m³ = milligrams per cubic meter
NS = no standard

Table 4-2. Federal and State Attainment Status

Pollutant	State Status	Federal Status
O_3	Non-attainment, Extreme	Non-attainment, Extreme [1]
PM_{10}	Non-attainment	Non-attainment, Serious
$PM_{2.5}$	Non-attainment	Non-attainment [2]
CO	Attainment	Maintenance
NO_2	Attainment	Maintenance
SO_2	Attainment	Attainment
Pb	Attainment	Attainment [3]

Source: CARB 2009
Notes:
[1] *On August 27, 2009, the EPA proposed to reclassify the SoCAB non-attainment area from severe-17 to extreme (74 FR 43654).*
[2] *On October 8, 2009, the EPA issued a final Federal Register notice designating the attainment status for the 24-hour NAAQS for $PM_{2.5}$ (EPA 2009). The notice was effective on December 14, 2009.*
[3] *Los Angeles County was designated as in attainment for the previous Pb NAAQS; however, the EPA has not proposed area designations under the current NAAQS. CARB recommended that Los Angeles County be designated as in non-attainment in August 2009 (CARB 2009).*
Key:
O_3 = ozone
PM_{10} = inhalable particulate matter
$PM_{2.5}$ = fine particulate matter
CO = carbon monoxide
NO_2 = nitrogen dioxide
SO_2 = sulfur dioxide
Pb = lead

4.1.1.2 State

The CCAA, signed into law in 1988, requires all areas of the state to achieve and maintain CAAQS by the earliest practicable date. CAAQS are at least as stringent as, and often more stringent than, NAAQS. Table 4-1 lists currently applicable CAAQS and NAAQS. Attainment status for each pollutant with regard to CAAQS is presented in Table 4-2.

The California Air Resources Board (CARB) has jurisdiction over a number of air pollutant emission sources in the state. Specifically, CARB can develop emission standards for on-road motor vehicles, stationary sources and some off-road mobile sources. CARB has delegated authority to regional air pollution control and air quality management districts to develop stationary source emission standards, issue air quality permits, and enforce permit conditions.

4.1.1.3 Regional

Under conformity regulations of the CAA, SCAG is the metropolitan planning organization (MPO) responsible for coordinating the development of transportation infrastructure in the Southern California region. This ensures that air quality objectives are included with transportation goals in regional transportation plans. (40 CFR 93) SCAG predicts population and business growth in the region.

SCAG estimates future demand for traffic (VMT) seaports, airports, and heavy and light rail infrastructure. From the demand estimates, SCAG develops a Regional Transportation Plan (RTP) and Regional Transportation Improvement Program (RTIP) to guide transportation growth and infrastructure development. The RTIP and RTP consider air quality requirements in the region. SCAG updates its forecasts approximately every three years. SCAQMD uses VMT, as well as activities predicted for seaports, airports, and rail, to develop updates to Air Quality Management Plans (AQMPs) discussed below.

4.1.1.3 Local

The SCAQMD has jurisdiction over an area of 10,743 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. The SoCAB is a sub-region within SCAQMD's jurisdiction covering an area of 6,745 square miles. While air quality in this area has improved, activity in the basin requires more regulation to meet ambient air quality standards.

The SCAQMD has adopted a series of AQMPs to meet CAAQS and NAAQS. These plans mandate control technology for existing sources, control programs for area sources and indirect sources, a permitting system designed to ensure no net increase in emissions from any new or modified permitted sources of emissions, transportation control measures, sufficient control strategies to achieve a five percent or more annual reduction in emissions (or 15 percent or more in a three-year period) for VOC, NOx, CO, and PM_{10}, and demonstration of compliance with CARB's established reporting periods for compliance with air quality goals.

The current, EPA-approved SIPs for each federal nonattainment or maintenance pollutant in the SoCAB are summarized below:

- O_3 – 1997 Air Quality Management Plan and 1999 amendments, approved by EPA on April 10, 2000 (65 FR 18903)
- CO – 2005 maintenance plan and request for re-designation to attainment status, approved by EPA on May 11, 2007 (72 FR 26718)
- PM_{10} – 1997 Air Quality Management Plan and supplemental information, approved by EPA on April 18, 2003 (68 FR 19315)
- PM2.5 – No EPA-approved SIP
- NO_2 – SIP approved by EPA on July 24, 1998 (63 FR 39747), based on the 1997 AQMP. In this SIP approval, EPA also re-designated the SoCAB from nonattainment to attainment/maintenance for NO_2.

On June 1, 2007, SCAQMD adopted a comprehensive update, the 2007 AQMP for the SoCAB. The 2007 AQMP outlines air pollution control measures needed to meet federal O_3 and $PM_{2.5}$ standards. The 2007 AQMP was approved by CARB and submitted to EPA for its final approval on September 27, 2007.

4.1.2 Existing Conditions

4.1.2.1 Climate and Atmospheric Conditions

The climate of the SoCAB is determined primarily by terrain and geography. Regional meteorology is dominated by a persistent high pressure area that commonly resides over the eastern Pacific Ocean. Seasonal variations in strength and position of this pressure cell cause changes in area weather patterns. Local climactic conditions are characterized by warm summers, mild winters, infrequent rainfall, moderate daytime on-shore breezes, and moderate humidity. The SoCAB's normally mild climate is occasionally interrupted by periods of hot weather, winter storms, and hot easterly Santa Ana winds.

The SoCAB area has high levels of air pollution, particularly from June through September. Factors leading to high levels of pollution include a large amount of pollutant emissions, light winds, and shallow vertical atmospheric mixing. These factors reduce pollutant dispersion, exacerbating elevated air pollution levels. Pollutant concentrations in the SoCAB vary by location, season and time of day. Concentrations of O_3, for example, tend to be lower along the coast and in far inland areas of the basin and adjacent desert and higher in and near inland valleys.

Over the past 30 years, substantial progress has been made in reducing air pollution levels in Southern California. Previously, the EPA designated SoCAB as a non-attainment area for all NAAQS except SO_2. The EPA now designates SoCAB as in attainment for NO_2, lead, SO_2, and CO. PM_{10}, $PM_{2.5}$, and O_3 levels, while reduced substantially from their peak, remain above relevant NAAQS and CAAQS.

4.1.2.2 Existing Air Quality Conditions

Air quality conditions for a project area are typically the result of meteorological conditions and existing emission sources in an area.

Monitoring Data – Criteria Pollutants

Air quality data from a monitoring station near the area of analysis is summarized in Table 4-3. This memo used monitoring data from the central Los Angeles station (North Main Street, CARB Number 70087). This station best represents air quality conditions at the project area; or, in the case of ozone, best represents air quality conditions for the region as a whole.

1-hour O_3 CAAQS were exceeded up to 8 times a year between 2006 and 2008 (see Table 4-3). Recorded 8-hour O_3 concentrations exceeded NAAQS up to 3 times a year between 2006 and 2008. Substantial year-to-year variations in monitored O_3 levels are common. No clear trend in O_3 levels is demonstrated by monitoring results from 2006 through 2008.

The 24-hour and annual PM_{10} and annual $PM_{2.5}$ CAAQS were exceeded during the 2006 to 2008 monitoring period. However, the PM_{10} NAAQS was not exceeded (see Table 4-3).

Table 4-3. Summary of Pollutant Monitoring Data Near Study Area

Criteria Air Pollutant	Annual Monitoring Data		
	2006	2007	2008
Carbon Monoxide (CO)			
Highest 1-hour concentration (ppmv)	3.5	3.2	2.9

Table 4-3. Summary of Pollutant Monitoring Data Near Study Area

Criteria Air Pollutant	Annual Monitoring Data		
	2006	2007	2008
Highest 8-hour concentration (ppmv)	2.68	2.15	1.96
Days above CAAQS [1]	0	0	0
Days above NAAQS [2]	0	0	0
Ozone (O_3), 1-hour			
1st High (ppmv)	0.108	0.115	0.109
2nd High (ppmv)	0.108	0.111	0.103
Days above CAAQS [3]	8	3	3
Ozone (O_3), 8-hour			
1st High (ppmv)[4]	0.079/0.079	0.102/0.103	0.09/0.09
2nd High (ppmv)[4]	0.077/0.077	0.093/0.094	0.081/0.081
Days above CAAQS [5]	7	6	6
Days above NAAQS [6]	3	3	3
Sulfur Dioxide (SO_2)			
Maximum 24-hour concentration (ppmv)	0.006	0.005	0.003
Annual Average	0.002	0.001	0.001
Inhalable Particulate Matter (PM_{10})			
Highest 24-hour concentration ($\mu g/m^3$)[4]	59/58	78/77	66/64
Annual mean ($\mu g/m^3$)[4]	30.1/30.1	33.3/33	32.2/*
Estimated number of days above CAAQS [7,8]	18.1	31	*

Table 4-3. Summary of Pollutant Monitoring Data Near Study Area			
Criteria Air Pollutant	Annual Monitoring Data		
	2006	2007	2008
Estimated number or days above NAAQS [8,9]	0	0	0
Fine Particulate Matter ($PM_{2.5}$)			
Highest 24-hour concentration (µg/m^3)[4]	56.2/56.2	64.1/64.1	43.7/43.7
Annual mean (µg/m^3)[4]	15.6/16	16.8/*	*/*
Estimated number of days above NAAQS [8,10]	11.7	*	*

Source: CARB 2009
Notes:
[1] Days above standard = days above 8-hour CAAQS of 9.0 ppmv
[2] Days above standard = days above 8-hour NAAQS of 9 ppmv
[3] Days above standard = days above 1-hour CAAQS of 0.09 ppmv
[4] Different methods of analyzing monitoring pollutants are used by EPA and CARB; therefore, both data are provided, respectively, separated by "/"
[5] Days above standard = days above 8-hour CAAQS of 0.070 ppmv
[6] Days above standard = days above 8-hour NAAQS of 0.075 ppmv
[7] Days above standard = days above 24-hour CAAQS of 50 µg/m3
[8] Most PM measurements are taken every 6 days; therefore, the number of days over the 24-hour standard in any year is estimated mathematically.
[9] Days above standard = days above 24-hour NAAQS of 150 µg/m3
[10] Days above standard = days above 24-hour NAAQS of 35 µg/m3
Key:
** = There was insufficient data available throughout the year to determine the value.*
ppmv = parts per million by volume
CAAQS = California Ambient Air Quality Standard
NAAQS = National Ambient Air Quality Standard
µg/m3 = micrograms per cubic meter

Intersection Analysis – CO Hot Spots

Carbon monoxide pollution can have localized impacts that require additional analysis if a roadway's level of service (LOS) could change or if sensitive populations could be adversely affected. In this case, a CO hot spots analysis, including a microscale analysis for CO concentrations, must be prepared. The SCAQMD requires that the following steps be used to determine if a localized CO impact exists (SCAQMD 1993):

- Determine "No Project" ambient concentration of CO emissions
- Estimate CO emissions from the project by modeling
- Add the "No Project" ambient concentration level of CO emissions to those generated by the project
- Compare the total project impact to the state 1-hour and 8-hour CO standards
- If modeling indicates a CO hot spot could occur, determine if any sensitive receptors are located in the area
- Identify the level of CO emissions at sensitive receptors
- Compare the levels of CO emissions at sensitive receptors to the state 1-hour and 8-hour CO standards

Existing ambient CO concentrations for 1-hour and 8-hour standards are 3.5 ppm and 2.68 ppm respectively. These values represent the maximum concentration observed during the past three years of sampling data. The analysis estimated future background concentrations by multiplying existing ambient background conditions by the ratio of future and current traffic and the ratio of future to current emission factors. This approach follows the requirements of 40 CFR 93.123(c)(2). This study predicts background 1-hour and 8-hour CO concentrations in 2035 of 1.2 ppm and 0.9 ppm respectively.

This study conducted a CO hot spots analysis for five intersections. This study used the screening procedure included in the CO Protocol to identify the worst intersections. The CAL3QHC model was used to estimate existing CO concentrations at each intersection (see Table 4-4). Under existing conditions, none of the study intersections exceed the 1-hour or 8-hour CO CAAQS of 9 and 20 ppm respectively. (The 8-hour CO NAAQS is 35 ppm.)

Sensitive Receptors

In completing the health risk assessment required under CEQA, this study identified sensitive receptors within the project area. Sensitive receptors are typically locations where the elderly, children, or other groups with a greater susceptibility to adverse health effects could be located. These locations include schools, hospitals, convalescent homes, parks, and daycares. Sensitive receptors identified in the project area are listed in Table 4-5.

Table 4-4. Maximum Carbon Monoxide Concentrations at Roadway Intersections – Baseline (2009)

ID	Intersection	Traffic CO Conc. (ppm)		Max. Conc. (ppm)	
		1-Hour	8-Hour	1-Hour[1]	8-Hour[2]
5	1st St & Main St	0.70	0.49	4.20	3.17
12	2nd St & Hill St	0.40	0.28	3.90	2.96
57	Temple St and Main St	0.70	0.49	4.20	3.17
58	Temple St and Los Angeles St	0.70	0.49	4.20	3.17
60	Temple St and Alameda St	0.70	0.49	4.20	3.17

[1] *Background (1-Hour): 3.5 ppm*
[2] *Background (8-Hour): 2.68 ppm*

Table 4-5. Sensitive Receptors in Study Area

Type	Description	Approximate Location (UTM, meters)	
		Easting	Northing
Park	Pershing Square	384365	3768245
Park	Grand Hope Park	383651	3767793
Park	Fort Moore Pioneer Memorial	385419	3769303
School	Gratts Elementary School	383419	3769295
School	Kedren Maryland Preschool	383586	3769119
School	Riley High School	383410	3768925
School	CDS Elementary School	383960	3769106

Table 4-5. Sensitive Receptors in Study Area

Type	Description	Approximate Location (UTM, meters)	
		Easting	Northing
School	The Colburn School	384702	3768841
School	Animo High Schools	384207	3768855
School	Roybal High School	384213	3769624
School	Downtown Business Magnet School/High School	384547	3769832
School	LA Unified Alternative Education High School	385144	3769504
School	Pacific Charter School Development	384923	3768679
School	Contreras High School	383566	3769304
School	LA Schools	386484	3769050
Hospital	Good Samaritan Hospital	383226	3768774
Hospital	Community Hospital of Huntington Park	384432	3768639
Hospital	VA Greater LA Healthcare Systems LA Ambulatory Care Center	385679	3768680

UTM Zone 11

Existing Operational Emissions

In determining impact significance, CEQA analysis requires comparing future project alternatives to existing conditions. This analysis compiled emissions inventories for the baseline year (2009). These figures were used to calculate the difference between future and existing conditions.

Operational emissions in this project analysis include emissions from traffic VMT and operation of LRT vehicles. Since LRT vehicles would be operated by electricity, there would be no direct emissions of criteria pollutants. Thus, LRT vehicle-related emissions are not further considered for air quality impacts (see chapter 6.4.11 that addresses potential climate-change impacts and indirect emissions of greenhouse gases from proposed project operations).

Emission modeling in this memo considers only passenger vehicles (light-duty automobiles and trucks in the model). This analysis used the EMFAC2007 model to generate emission factors for these vehicle types. Table 4-6 provides a summary of highway traffic emissions in the study area.

Table 4-6. Existing Conditions 2009 Highway Traffic Emissions

Highway Type	Emissions					
	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
Emission Factor (g/mi)	0.084	2.760	0.266	0.004	0.404	0.075
Daily Emissions (lbs/day)	56,200	1,847,200	178,000	2,700	270,400	49,900
Annual Emissions (tpy)	10,300	337,100	32,500	500	49,300	9,100

Key:
g/mi = grams per mile
lbs/day – pounds per day
tpy = tons per year

Operation of vehicles associated with this project would result in emissions of TACs. Emissions of TACs are summarized in Table 4-7 for informational purposes only. VMT numbers provided by the project traffic consultant consider only light-duty automobiles and trucks. Since the majority of these vehicles are gasoline-fueled, the TAC emission calculations assumed that all emissions would come from gasoline-fueled vehicles.

This analysis used speciation profiles obtained from CARB. The analysis includes emissions from exhaust (VOC profile no. 441; PM profile no. 400), tire wear (PM profile no. 472), brake wear (PM profile no. 473), and paved road dust (PM profile no. 471).

Table 4-7. Existing Conditions 2009 Toxic Air Contaminant Operational Emissions			
TAC	CAS #	Emissions	
		(lbs/hr)	(lbs/yr)
Volatile Organic Compounds			
1,3-Butadiene	106-99-0	0.050	435
Acetaldehyde	75-07-0	0.022	190
Acrolein	107-02-8	0.012	107
Benzene	71-43-2	0.24	2,083
Ethyl benzene	100-41-4	0.10	847
Formaldehyde	50-00-0	0.15	1,342
Methanol	67-56-1	0.037	321
Methyl ethyl ketone	78-93-3	0.0017	15
Methyl t-butyl ether	1634-04-4	0.18	1,534
m-Xylene	108-38-3	0.33	2,876
Naphthalene	91-20-3	0.0043	38
n-Hexane	110-54-3	0.14	1,251
o-Xylene	95-47-6	0.11	999
Propylene	115-07-1	0.28	2,471
Styrene	100-42-5	0.011	100
Toluene	108-88-3	0.53	4,646

Table 4-7. Existing Conditions 2009 Toxic Air Contaminant Operational Emissions

TAC	CAS #	Emissions	
		(lbs/hr)	(lbs/yr)
Inorganic Compounds			
Arsenic	7440-38-2	0.00023	2.0
Cadmium	7440-43-9	0.000052	0.45
Chlorine	7782-50-5	0.084	737
Copper	7440-50-8	0.010	89
Lead	7439-92-1	0.0022	20
Manganese	7439-96-5	0.015	135
Mercury	7439-97-6	0.00016	1.4
Nickel	7440-02-0	0.0011	10
Selenium	7782-49-2	0.000054	0.47

Key:
TAC = toxic air contaminant
CAS = Chemical Abstracts Service
lbs/hr = pounds per hour
lbs/yr = pounds per year

5.0 IMPACTS

This section describes the results of the impact analysis conducted for the proposed Regional Connector Transit Corridor project.

5.1 Transportation Conformity

A transportation conformity determination is required for approval, funding, or implementation of FWHA/FTA projects. Transportation conformity provisions apply to emissions of O_3, CO, NO_2, PM_{10}, and $PM_{2.5}$ in nonattainment and maintenance areas. Transportation conformity determinations ensure that projects receiving federal funding or approval are consistent with air quality goals. A conformity determination demonstrates that the total emissions for a project are within emissions budgets established in a SIP.

The current, regional RTIP already includes the Regional Connector Transit Corridor project. As a result, this analysis is not required to demonstrate compliance with emissions budgets. It is necessary, however, to complete an analysis for localized impacts of CO, PM_{10}, and $PM_{2.5}$. As listed in 40 CFR 93 Subpart A, project-level conformity occurs when the following three conditions are met:

- The FHWA/FTA project must not cause or contribute to any new localized CO, PM_{10}, and/or $PM_{2.5}$ violations (§93.116).
- The project must not increase the frequency or severity of any existing CO, PM_{10}, and/or $PM_{2.5}$ violations in nonattainment or maintenance areas (§93.116).
- The project must comply with any PM_{10} and $PM_{2.5}$ control measures in the applicable implementation plan (§93.117).

The EPA published standards in *Transportation Conformity Guidance for Qualitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (2006). A PM_{10} or $PM_{2.5}$ hot spots analysis must be completed only for "projects of air quality concern," as defined in 40 CFR 93.123(b)(1). A project of air quality concern is defined as a project that could result in a significant increase in the number of diesel vehicles.

The proposed project would decrease the overall number of vehicles in the region, and it would not cause an increase in diesel vehicles. As a result, the proposed project would neither cause new PM_{10} or $PM_{2.5}$ hot spots nor increase the frequency or severity of existing PM_{10} or $PM_{2.5}$ violations. No localized adverse impacts from CO are expected under this project. The proposed project would implement the various PM_{10} and $PM_{2.5}$ control measures contained in the RTP and RTIP and meet the requirements of §93.117. No further action is required for transportation conformity.

5.2 Mobile Source Air Toxics

The FHWA published an *Interim Guidance Update on Mobile Source Air Toxic Analyses in NEPA Documents* on September 30, 2009. This guidance document establishes the following tiered approach for analyzing mobile source air toxics (MSAT) in NEPA:

- No analysis for projects with no potential for meaningful MSAT effects
- Qualitative analysis for projects with low potential MSAT effects
- Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.

The proposed project would have no MSAT effects because VMT for each of the build alternatives would decrease compared to the No Build Alternative. The proposed project falls within the first tier of MSAT analysis, so no further action is required.

5.3 No Build Alternative

The No Build Alternative assumes none of the project alternatives would be built. This section provides a summary of the emissions associated with the No Build Alternative.

5.3.1 Operational Emissions

The No Build Alternative would not create new emissions or have negative operational air quality impacts. However, the No Build Alternative would not reduce regional VMT-related emissions like other alternatives.

NEPA requires project emissions to be compared to the future No Build Alternative. This analysis calculated operational emissions from predicted VMT under the No Build Alternative. Emissions of CO, NOx, and SO_2 represent emissions from vehicle exhaust only. Emissions of PM_{10} and $PM_{2.5}$ include exhaust, tire wear, brake wear, and paved road dust. VOC emissions include exhaust and evaporative losses. Table 5-1 summarizes operational emissions associated with the No Build Alternative.

Table 5-1. No Build Alternative 2035 Highway Traffic Emissions						
Highway Type	Emissions					
	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
Emission Factor (g/mi)	0.019	0.867	0.057	0.005	0.424	0.094
Daily Emissions (lb/day)	21,100	962,500	63,300	5,600	470,700	103,800
Annual Emissions (tpy)	3,800	175,700	11,500	1,000	85,900	18,900

5.3.2 Construction Emissions

The No Build Alternative would not result in any construction emissions.

5.3.3 Cumulative Emissions

The No Build Alternative would involve neither construction nor new transit operations; therefore, there would be no cumulative impacts under the No Build Alternative.

5.4 Transportation System Management (TSM) Alternative

5.4.1 Operational Regional Emissions

The TSM Alternative focuses on enhancements to and restructuring of existing transit service in the project area. In addition to provisions in Metro's LRTP, two new shuttle bus routes would link the 7th Street/Metro Center Station to Union Station. The TSM Alternative would not involve construction of tracks or stations outside of projects already approved in the LRTP. The creation of peak hour bus-only lanes would not require new construction. New bus lanes would be created by restricting parking on streets that do not already have dedicated bus lanes.

5.4.1.1 Criteria Pollutant Emissions

Bus Operations

Buses added under the TSM Alternative would be fueled by CNG. Emission factors for CNG buses were estimated from technical studies provided by CARB. Table 5-2 shows emissions from CNG buses.

Table 5-2. TSM Alternative Bus Operations Emissions

Line	Service Line	Emissions (lbs/day)				
		VOC	CO	NOx	SO_2	PM
1	Upper Grand Southbound via Los Angeles	<1	7	14	<1	2
2	Upper Grand Northbound via Los Angeles	<1	7	16	<1	2
3	Upper Grand Southbound via Alameda	<1	8	16	<1	2
4	Upper Grand Northbound via Alameda	<1	8	18	<1	3
5	3rd Street Southbound	<1	17	35	<1	5
6	2nd Street Northbound	<1	18	37	<1	6
	Total	**1**	**65**	**136**	**<1**	**21**

Highway Traffic

The TSM Alternative would indirectly affect emissions from highway traffic. Table 5-3 shows operational emissions from VMT. Operational emissions were calculated using the same methodology as in the No Build Alternative analysis.

Table 5-3. TSM Alternative 2035 Highway Traffic Emissions						
Highway Type	Emissions					
	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
Emission Factors (g/mi)	0.019	0.867	0.057	0.005	0.424	0.094
Daily Emissions (lbs/day)	21,100	962,000	63,200	5,500	470,500	103,800
Annual Emissions (tpy)	3,800	175,600	11,500	1,000	85,900	18,900

Total Emissions for TSM Alternative

Emissions from operation of buses associated with the TSM Alternative are considered together with highway emissions. The resulting emissions were compared to thresholds of significance for CEQA and NEPA. NOx emissions would exceed NEPA significance criteria. Emissions of other criteria pollutants under this alternative would not exceed CEQA or NEPA thresholds; thus, they would not be significant. Table 5-4 shows total regional operational emissions under this alternative.

Table 5-4. Total Regional Operational Impacts for TSM Alternative						
Type	Emissions (lbs/day)					
	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
CEQA Analysis						
Bus Operations	1	65	136	<1	21	21
Highway	21,100	962,000	63,200	5,500	470,500	103,800
Total	**21,100**	**962,100**	**63,300**	**5,500**	**470,500**	**103,800**
Existing Conditions	56,200	1,847,200	178,000	2,700	270,400	49,900

Table 5-4. Total Regional Operational Impacts for TSM Alternative						
Type	Emissions (lbs/day)					
	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
Increment above Existing Conditions	(35,100)	(885,100)	(114,700)	2,800	200,102	53,900
No Build Alt (2035).	21,100	962,500	63,300	5,600	470,700	103,800
Increment above No Build Alt.	0	(400)	0	(100)	(200)	0
CEQA Threshold	55	150	55	550	150	55
Significant?	No	No	No	No	No	No
NEPA Analysis						
Bus Operations	<1	11	23	<1	3	3
Highway	3,800	175,600	11,500	1,000	85,900	18,900
Total	**3,800**	**175,600**	**11,500**	**1,000**	**85,900**	**18,900**
No Build Alternative	3,800	175,700	11,500	1,000	85,900	18,900
Increment	(2)	(85)	**16**	(1)	(43)	(7)
NEPA Threshold	10	100	10	100	70	100
Significant	No	No	No	No	No	No

Note: Negative numbers (beneficial impacts) are shown in parentheses. Emissions greater than threshold of significance are shown in ***bold****.*

5.4.1.2 Toxic Air Contaminant Emissions

The TSM Alternative would result in emissions of TACs from bus operations. This alternative would indirectly result in added TAC emissions from highway vehicles. Emissions under this alternative (emissions from buses and highway traffic) were compared to existing conditions

(2009) for informational purposes only. Since the EMFAC model only provides emission results for criteria pollutants, it is necessary to use published profiles of the individual compounds emitted in the exhaust to create an inventory of TACs.

Table 5-5 shows a summary of project-related emissions. The emission increment (TSM Alternative compared to Existing Conditions) is provided for informational purposes, but is not used for significance determinations as noted in Section 3.1.2.1.

Table 5-5. TSM Alternative 2035 Toxic Air Contaminant Operational Emissions

TAC	CAS	Emissions		Emission Increment	
		(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)
Volatile Organic Compounds					
1,3-Butadiene	106-99-0	0.011	96	(0.039)	(339)
Acetaldehyde	75-07-0	0.0048	42	(0.017)	(148)
Acrolein	107-02-8	0.0027	23	(0.0095)	(83)
Benzene	71-43-2	0.052	459	(0.19)	(1,624)
Ethyl benzene	100-41-4	0.021	187	(0.075)	(660)
Formaldehyde	50-00-0	0.034	296	(0.12)	(1,047)
Methanol	67-56-1	0.0081	71	(0.029)	(250)
Methyl ethyl ketone	78-93-3	0.00038	3.3	(0.0013)	(12)
Methyl t-butyl ether	1634-04-4	0.039	338	(0.14)	(1,196)
m-Xylene	108-38-3	0.072	633	(0.26)	(2,242)
Naphthalene	91-20-3	0.0010	8.4	(0.0034)	(30)
n-Hexane	110-54-3	0.031	276	(0.11)	(976)
o-Xylene	95-47-6	0.025	220	(0.089)	(779)

Table 5-5. TSM Alternative 2035 Toxic Air Contaminant Operational Emissions

TAC	CAS	Emissions		Emission Increment	
		(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)
Propylene	115-07-1	0.062	544	(0.22)	(1,927)
Styrene	100-42-5	0.0025	22	(0.0089)	(78)
Toluene	108-88-3	0.12	1,023	(0.41)	(3,622)
Inorganic Compounds					
Arsenic	7440-38-2	0.00026	2.3	0.000035	0.30
Cadmium	7440-43-9	0.000060	0.52	0.0000078	0.068
Chlorine	7782-50-5	0.15	1,283	0.062	545
Copper	7440-50-8	0.012	106	0.0019	17
Lead	7439-92-1	0.0026	22	0.00034	2.9
Manganese	7439-96-5	0.018	158	0.0027	23
Mercury	7439-97-6	0.00018	1.6	0.000023	0.20
Nickel	7440-02-0	0.0017	15	0.00052	4.6
Selenium	7782-49-2	0.000062	0.54	0.0000081	0.071

Key:
TAC = toxic air contaminant
CAS = Chemical Abstracts Service
lbs/hr = pounds per hour
lbs/yr = pounds per year

5.4.2 CO Hot Spots

This analysis completed a CO hot spots evaluation that calculated localized impacts of CO concentrations at several intersections. A screening level analysis was completed using Appendix A of the CO Protocol to determine five intersections that would be most adversely affected under this alternative. The CAL3QHC model was used to evaluate whether CO concentrations at these intersections would exceed CAAQS or NAAQS for CO concentrations. Table 5-6 shows the results of the analysis.

Table 5-6. Maximum Carbon Monoxide Concentrations at Roadway Intersections Under TSM Alternative (2035)

ID	Intersection	Traffic CO Conc. (ppm)		Max. Conc. (ppm)		Exceeds Threshold?	
		1-Hr	8-Hr	1-Hr	8-Hr	1-Hr	8-Hr
5	1st Street and Main Street	0.20	0.14	1.40	1.04	No	No
12	2nd Street and Hill Street	0.10	0.07	1.30	0.97	No	No
57	Temple Street and Main Street	0.20	0.14	1.40	1.04	No	No
58	Temple Street and Los Angeles Street	0.10	0.07	1.30	0.97	No	No
60	Temple Street and Alameda Street	0.20	0.14	1.40	1.04	No	No

Notes:
1-Hour CAAQS = 9.0 ppm; 1-Hour NAAQS = 9 ppm
8-Hour CAAQS = 20 ppm; 8-Hour NAAQS = 35 ppm

5.4.3 Construction Emissions

The TSM Alternative would not involve any construction. As a result, there would be no emissions associated with construction.

5.4.4 Cumulative Emissions

Operational emissions associated with the TSM Alternative would not exceed NEPA or CEQA significance thresholds for all criteria pollutants. It is difficult to specify what other projects will be undertaken in 2035. However, this alternative would result in substantial reductions in peak daily emissions of CO, SO_2, and PM_{10}. Impacts from emissions of these pollutants would not be cumulatively significant. However, the federally-approved RTP and RTIP include an electric light rail project like the Regional Connector project. Not developing such a project would result in higher VMT and emissions than listed in the RTP Programmatic Environmental Impact Report. Thus, cumulative impacts could be significant under NEPA.

5.5 At-Grade Emphasis LRT Alternative

Under the At-Grade Emphasis LRT Alternative, about half of the operation of the proposed light rail extension would run at street level. This section summarizes emissions associated with this alternative.

5.5.1 Operational Emissions

Operational emissions associated with the At-Grade Emphasis LRT Alternative include emissions from highway traffic that would exist after this project alternative is operational. The proposed project would provide an alternative to automobile transportation in the region; therefore, it was necessary to evaluate highway traffic to assess how the proposed project would increase or decrease operational emissions from passenger vehicles.

5.5.1.1 Criteria Pollutant Emissions

Table 5-7 shows operational emissions from VMT under this alternative. Emissions of all pollutants would not be significant under a NEPA or CEQA analysis.

Table 5-7. At-Grade Emphasis LRT Alternative 2035 Operational Emissions

Type	Emissions (lbs/day)					
	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
CEQA Analysis						
Project Emissions	21,000	962,000	63,200	5,500	470,400	103,800
Existing Conditions	56,200	1,847,200	178,000	2,700	270,400	49,900
Increment above Existing Conditions	(35,100)	(885,200)	(114,800)	2,800	200,000	53,900
No Build Alt (2035).	21,100	962,500	63,300	5,600	470,700	103,800
Increment above No Build Alt.	0	(500)	(100)	(100)	(300)	0
CEQA Threshold	55	150	55	550	150	55
Significant?	No	No	No	No	No	No

Table 5-7. At-Grade Emphasis LRT Alternative 2035 Operational Emissions						
Type	Emissions (lbs/day)					
	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
NEPA Analysis						
Project Emissions	3,800	175,600	11,500	1,000	85,900	18,900
No Build Alternative	3,800	175,700	11,500	1,000	85,900	18,900
Increment	(2)	(105)	(7)	(1)	(51)	(11)
NEPA Threshold	10	100	10	100	70	100
Significant	No	No	No	No	No	No

Note: Negative numbers (beneficial impacts) are shown in parentheses.

5.5.1.2 Toxic Air Contaminant Emissions

The At-Grade Emphasis LRT Alternative would indirectly result in increased emissions of TACs from highway traffic. Emissions under this alternative were compared to existing conditions (2009) for informational purposes only. Since the EMFAC model only provides emission results for criteria pollutants, it is necessary to use published profiles of the individual compounds emitted in the exhaust to create an inventory of TACs.

Table 5-8 shows a summary of project-related emissions. The emission increment (At-Grade Emphasis LRT Alternative compared to Existing Conditions) is provided for informational purposes, but is not used for significance determinations as noted in Section 3.1.2.1.

Table 5-8. At-Grade Emphasis LRT Alternative 2035 Toxic Air Contaminant Operational Emissions

TAC	CAS	Emissions		Emission Increment	
		(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)
Volatile Organic Compounds					
1,3-Butadiene	106-99-0	0.011	95	(0.039)	(339)
Acetaldehyde	75-07-0	0.0048	42	(0.017)	(149)
Acrolein	107-02-8	0.0027	23	(0.010)	(83)
Benzene	71-43-2	0.052	457	(0.19)	(1,625)
Ethyl benzene	100-41-4	0.021	186	(0.075)	(661)
Formaldehyde	50-00-0	0.034	295	(0.12)	(1,047)
Methanol	67-56-1	0.0080	70	(0.029)	(250)
Methyl ethyl ketone	78-93-3	0.00038	3.3	(0.0013)	(12)
Methyl t-butyl ether	1634-04-4	0.038	337	(0.14)	(1,197)
m-Xylene	108-38-3	0.072	632	(0.26)	(2,244)
Naphthalene	91-20-3	0.0010	8.3	(0.0034)	(30)
n-Hexane	110-54-3	0.031	275	(0.11)	(977)
o-Xylene	95-47-6	0.025	220	(0.089)	(780)
Propylene	115-07-1	0.062	543	(0.22)	(1,929)
Styrene	100-42-5	0.0025	22	(0.0089)	(78)
Toluene	108-88-3	0.12	1,020	(0.41)	(3,625)
Inorganic Compounds					

Table 5-8. At-Grade Emphasis LRT Alternative 2035 Toxic Air Contaminant Operational Emissions

TAC	CAS	Emissions		Emission Increment	
		(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)
Arsenic	7440-38-2	0.00026	2.3	0.000034	0.30
Cadmium	7440-43-9	0.000059	0.52	0.0000076	0.067
Chlorine	7782-50-5	0.15	1,279	0.062	542
Copper	7440-50-8	0.012	106	0.0019	16
Lead	7439-92-1	0.0026	22	0.00033	2.9
Manganese	7439-96-5	0.018	158	0.0026	23
Mercury	7439-97-6	0.00018	1.6	0.000023	0.20
Nickel	7440-02-0	0.0017	14	0.00052	4.6
Selenium	7782-49-2	0.000062	0.54	0.0000080	0.070

Key:
TAC = toxic air contaminant
CAS = Chemical Abstracts Service
lbs/hr = pounds per hour
lbs/yr = pounds per year

5.5.2 CO Hot Spots

This analysis completed a CO hot spots evaluation that calculated localized impacts of CO concentrations at several intersections. A screening level analysis was completed using Appendix A of the CO Protocol to determine five intersections that would be most adversely affected under this alternative. The CAL3QHC model was used to evaluate whether CO concentrations at these intersections would exceed CAAQS or NAAQS for CO concentrations. Table 5-9 shows the results of the analysis.

5.5.3 Construction Emissions

The At-Grade Emphasis LRT Alternative would result in temporary emissions associated with construction. Construction would occur between and including the years 2014 and 2017.

5.5.3.1 Criteria Pollutants

Regional Construction Emissions

SCAQMD requires an analysis of construction-related emissions. This analysis estimates emissions from off-road construction equipment, fugitive dust, construction worker commuting, and haul truck emissions. Table 5-10 shows construction emissions by peak day of operation.

Table 5-9. Maximum Carbon Monoxide Concentrations at Roadway Intersections Under At-Grade Emphasis LRT Alternative (2035)

ID	Intersection	Traffic CO Conc. (ppm)		Max. Conc. (ppm)		Exceeds Threshold?	
		1-Hr	8-Hr	1-Hr	8-Hr	1-Hr	8-Hr
5	1st Street and Main Street	0.20	0.14	1.40	1.04	No	No
12	2nd Street and Hill Street	0.10	0.07	1.30	0.97	No	No
57	Temple Street and Main Street	0.30	0.21	1.50	1.11	No	No
58	Temple Street and Los Angeles Street	0.10	0.07	1.30	0.97	No	No
60	Temple Street and Alameda Street	0.20	0.14	1.40	1.04	No	No

Notes:
1-Hour CAAQS = 9.0 ppm; 1-Hour NAAQS = 9 ppm
8-Hour CAAQS = 20 ppm; 8-Hour NAAQS = 35 ppm

Emissions of VOC, NOx, CO, PM_{10}, and $PM_{2.5}$ would be significant, and mitigation measures would need to be implemented.

Localized Significance Thresholds

This analysis evaluated construction emissions on a regional level and compared them to SCAQMD's LSTs. The analysis used a series of look-up tables for NOx, CO, PM_{10}, and $PM_{2.5}$. These tables show maximum allowable emission levels, which vary based on project location, size (acreage), and distance to the nearest receptor.

Most project construction sites would be approximately one acre in size and located within 25 meters of the nearest receptors. Although receptors in the project area may be closer than 25 meters to construction, it is the minimum distance allowed in the LST. Table 5-11 shows onsite emissions for each construction activity and location.

Table 5-10. At Grade Emphasis LRT Alternative (2014-2017) Maximum Daily Construction Emissions

Location	Daily Emissions (lbs/day)					
	VOC	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
Onsite	281	2,088	1,088	3	131	120
Offsite	8	87	62	<1	21	6
Total	**289**	**2,175**	**1,150**	4	**151**	**126**
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**.*

Table 5-11. At-Grade Emphasis LRT Alternative Localized Significance Thresholds (LST) for Construction Emissions

ID	Phase	Maximum Daily Onsite Emissions (lbs/day)			
		NOx	CO	PM_{10}	$PM_{2.5}$
1	Pre-Construction	**163**	65	**9**	**8**
2	Site Preparation	52	32	3	3
3	Cut & Cover Along Flower Street	**305**	150	**18**	**17**
4	Cut & Cover Flower/6th Street Station	**240**	127	**16**	**14**
5	U-Portal at Flower	**240**	127	**16**	**14**

Table 5-11. At-Grade Emphasis LRT Alternative Localized Significance Thresholds (LST) for Construction Emissions

ID	Phase	Maximum Daily Onsite Emissions (lbs/day)			
		NOx	CO	PM_{10}	$PM_{2.5}$
6	Portal NE of Flower & 3rd	**225**	114	**14**	**13**
7	Cut & Cover 2nd/Hope Street Station	**240**	127	**16**	**14**
8	Portal into 2nd Street Tunnel	**274**	145	**17**	**16**
9	Surface Trackwork	**217**	108	**13**	**12**
10	Improvements at Alameda/Temple Streets	**274**	145	**17**	**16**
11	At-Grade Stations	**106**	51	**6**	**6**
12	Operation Systems Installation	**168**	96	**11**	**10**
Allowable Emissions		74	680	5	3

*Note: Emissions greater than threshold of significance are shown in **bold**.*

LST evaluation indicates that NOx, PM_{10}, and $PM_{2.5}$ emissions would be greater than maximum allowable levels during several construction phases. Impacts of these pollutants would have to be mitigated.

5.5.3.2 Toxic Air Contaminants

Construction of the At-Grade Emphasis LRT Alternative would indirectly result in increased emissions of TACs. Projected emissions under this alternative were compared to existing conditions (2009) for CEQA analysis. The analysis includes a Tier 1 HRA, which compares emission levels to published screening limits.

The analysis considered only acute risks because construction impacts are temporary. Speciation profiles from CARB were used to estimate emissions of TACs from construction. Since the OFFROAD model only provides emission results for criteria pollutants, it is necessary to use published profiles of the individual compounds emitted in the exhaust to create an inventory of TACs. The analysis used profiles for diesel vehicle exhaust (profile no.

425) and construction dust (profile no. 420). Although DPM is a toxic air contaminant, it does not cause acute health effects and was not included in the analysis.

Table 5-12 shows a summary of project-related emissions and Tier 1 HRA results. Diesel exhaust does not have an organic profile in CARB's speciation profiles; therefore, the analysis was restricted to inorganic emissions. Impacts from construction emissions under the At-Grade Emphasis LRT Alternative would not be significant under CEQA.

Table 5-12. At-Grade Emphasis LRT Alternative (2014-2017) Construction Health Risk Assessment

TAC	CAS #	Emissions (lb/hr)	PSL (lb/hr)	PSI
Arsenic	7440-38-2	0.000028	0.00010	0.28
Chlorine	7782-50-5	0.0020	0.11	0.019
Copper	7440-50-8	0.00014	0.050	0.0028
Mercury	7439-97-6	0.00016	0.00090	0.18
Nickel	7440-02-0	0.00011	0.0030	0.035
ASI				0.52
Threshold				1

Key:
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

5.5.4 Cumulative Emissions

Operational emissions associated with the At-Grade Emphasis LRT Alternative would not exceed NEPA or CEQA significance thresholds for all criteria pollutants. It is difficult to specify what other projects will be undertaken in 2035. However, this alternative would result in substantial reductions in peak daily emissions of CO, NOx, SO_2, and PM_{10}. Impacts from emissions of these pollutants would not be cumulatively significant.

5.6 Underground Emphasis LRT Alternative

With the Underground Emphasis LRT Alternative, operation of the proposed light rail extension would run largely underground. This section summarizes emissions associated with this alternative.

5.6.1 Operational Emissions

Operational emissions associated with the Underground Emphasis LRT Alternative include emissions from highway traffic that would exist after this project alternative is operational. The proposed project would provide an alternative to automobile transportation in the region; therefore, it was necessary to evaluate highway traffic to assess how the proposed project would increase or decrease operational emissions from passenger vehicles.

5.6.1.1 Criteria Pollutant Emissions

Table 5-13 shows operational emissions from VMT under this alternative. Emissions of all pollutants would not be significant under a NEPA or CEQA analysis.

Table 5-13. Underground Emphasis LRT Alternative 2035 Operational Emissions

Type	Emissions (lbs/day)					
	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
CEQA Analysis						
Project Emissions	21,100	961,900	63,200	5,500	470,400	103,800
Existing Conditions	56,200	1,847,200	178,000	2,700	270,400	49,900
Increment above Existing Conditions	(35,100)	(885,300)	(114,800)	2,800	200,000	53,900
No Build Alt (2035).	21,100	962,500	63,300	5,600	470,700	103,800
Increment above No Build Alt.	0	(600)	(100)	(100)	(300)	0
CEQA Threshold	55	150	55	550	150	55
Significant?	No	No	No	No	No	No

Table 5-13. Underground Emphasis LRT Alternative 2035 Operational Emissions						
Type	Emissions (lbs/day)					
	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
NEPA Analysis						
Project Emissions	3,800	175,600	11,500	1,000	85,900	18,900
No Build Alternative	3,800	175,700	11,500	1,000	85,900	18,900
Increment	(2)	(109)	(7)	(1)	(53)	(12)
NEPA Threshold	10	100	10	100	70	100
Significant	No	No	No	No	No	No

Note: Negative numbers (beneficial impacts) are shown in parentheses.

5.6.1.2 Toxic Air Contaminant Emissions

The Underground Emphasis LRT Alternative would indirectly result in increased emissions of TACs from highway traffic. Emissions under this alternative were compared to existing conditions (2009) for informational purposes. Since the EMFAC model only provides emission results for criteria pollutants, it is necessary to use published profiles of the individual compounds emitted in the exhaust to create an inventory of TACs.

Table 5-14 shows a summary of project-related emissions. The emission increment (Underground Emphasis LRT Alternative compared to Existing Conditions) is provided for informational purposes, but is not used for significance determinations as noted in Section 3.1.2.1.

Table 5-14. Underground Emphasis LRT Alternative 2035 Toxic Air Contaminant Operational Emissions					
TAC	CAS	Emissions		Emission Increment	
		(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)
Volatile Organic Compounds					
1,3-Butadiene	106-99-0	0.011	95	(0.039)	(339)
Acetaldehyde	75-07-0	0.0048	42	(0.017)	(149)
Acrolein	107-02-8	0.0027	23	(0.010)	(83)
Benzene	71-43-2	0.052	457	(0.19)	(1,625)
Ethyl benzene	100-41-4	0.021	186	(0.075)	(661)
Formaldehyde	50-00-0	0.034	295	(0.12)	(1,048)
Methanol	67-56-1	0.0080	70	(0.029)	(250)
Methyl ethyl ketone	78-93-3	0.00038	3.3	(0.0013)	(12)
Methyl t-butyl ether	1634-04-4	0.038	337	(0.14)	(1,197)
m-Xylene	108-38-3	0.072	631	(0.26)	(2,245)
Naphthalene	91-20-3	0.0010	8.3	(0.0034)	(30)
n-Hexane	110-54-3	0.031	275	(0.11)	(977)
o-Xylene	95-47-6	0.025	219	(0.089)	(780)
Propylene	115-07-1	0.062	542	(0.22)	(1,929)
Styrene	100-42-5	0.0025	22	(0.0089)	(78)
Toluene	108-88-3	0.12	1,020	(0.41)	(3,626)
Inorganic Compounds					

Table 5-14. Underground Emphasis LRT Alternative 2035 Toxic Air Contaminant Operational Emissions

TAC	CAS	Emissions		Emission Increment	
		(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)
Arsenic	7440-38-2	0.00026	2.3	0.000034	0.30
Cadmium	7440-43-9	0.000059	0.52	0.0000076	0.066
Chlorine	7782-50-5	0.15	1,278	0.062	541
Copper	7440-50-8	0.012	106	0.0018	16
Lead	7439-92-1	0.0026	22	0.00033	2.9
Manganese	7439-96-5	0.018	157	0.0026	23
Mercury	7439-97-6	0.00018	1.6	0.000023	0.20
Nickel	7440-02-0	0.0017	14	0.00052	4.6
Selenium	7782-49-2	0.000062	0.54	0.0000079	0.069

Key:
TAC = toxic air contaminant
CAS = Chemical Abstracts Service
lbs/hr = pounds per hour
lbs/yr = pounds per year

5.6.2 CO Hot Spots

This analysis completed a CO hot spots evaluation that looked at localized impacts of CO concentrations at several intersections. A screening level analysis was completed using Appendix A of the CO Protocol to determine five intersections that could be most adversely affected under this alternative. The CAL3QHC model was used to evaluate whether CO concentrations at these intersections would exceed CAAQS or NAAQS for CO concentrations. Table 5-15 shows the results of the analysis.

Table 5-15. Maximum Carbon Monoxide Concentrations at Roadway Intersections Under Underground Emphasis LRT Alternative (2035)

ID	Intersection	Traffic CO Conc. (ppm)		Max. Conc. (ppm)		Exceeds Threshold?	
		1-Hr	8-Hr	1-Hr	8-Hr	1-Hr	8-Hr
5	1st Street and Main Street	0.20	0.14	1.40	1.04	no	no
12	2nd Street and Hill Street	0.10	0.07	1.30	0.97	no	no
57	Temple Street and Main Street	0.20	0.14	1.40	1.04	no	no
58	Temple Street and Los Angeles Street	0.20	0.14	1.40	1.04	no	no
60	Temple Street and Alameda Street	0.20	0.14	1.40	1.04	no	no

Notes:
1-Hour CAAQS = 9.0 ppm; 1-Hour NAAQS = 9 ppm
8-Hour CAAQS = 20 ppm; 8-Hour NAAQS = 35 ppm

5.6.3 Construction Emissions

The Underground Emphasis LRT Alternative would result in temporary emissions associated with construction. Construction would occur between and including the years 2014 and 2017.

The Underground Emphasis LRT Alternative has four construction sub-alternatives. The proposed 2nd/Hope Street station could be constructed using either SEM or cut & cover. Furthermore, a second proposed station could be built at either Broadway or Los Angeles Street. This emissions analysis evaluates all four construction options.

5.6.3.1 Criteria Pollutants

Regional Construction Emissions

SCAQMD requires an analysis of construction-related emissions. This analysis estimates emissions from off-road construction equipment, fugitive dust, construction worker commuting, and haul truck emissions. Table 5-16 shows construction emissions by peak day of operation.

Table 5-16. Underground Emphasis LRT Alternative (2014-2017) Maximum Daily Construction Emissions

Location	Daily Emissions (lbs/day)					
	VOC	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
2nd/Hope Streets Station (SEM) + Broadway Station Option						
Onsite	**300**	**2,247**	**1,189**	4	92	**83**
Offsite	8	89	59	<1	19	6
Total	**308**	**2,336**	**1,249**	4	111	**89**
2nd/Hope Streets Station (Cut & Cover) + Broadway Station Option						
Onsite	**304**	**2,280**	**1,210**	4	93	**84**
Offsite	9	94	62	<1	20	6
Total	**313**	**2,375**	**1,272**	4	113	**90**
2nd/Hope Streets Station (SEM) + Los Angeles Street Station						
Onsite	**300**	**2,247**	**1,189**	4	91	**83**
Offsite	8	85	58	<1	19	5
Total	**308**	**2,332**	**1,247**	4	110	**89**
2nd/Hope Streets Station (Cut & Cover) + Los Angeles Street Station						
Onsite	**304**	**2,280**	**1,210**	4	93	**84**
Offsite	8	91	61	<1	19	6
Total	**313**	**2,371**	**1,270**	4	113	**90**
Threshold	75	100	550	150	150	55

*Note: Significant emissions are shown in **bold**.*

Emissions of VOC, NOx, CO, and $PM_{2.5}$ would be significant, and mitigation measures would need to be employed.

Localized Significance Thresholds

This analysis evaluated construction emissions on a regional level and compared them to SCAQMD's LSTs. The analysis used a series of look-up tables for NOx, CO, PM_{10}, and $PM_{2.5}$. These tables show maximum allowable emission levels, which vary based on project location, size (acreage), and distance to the nearest receptor.

Most project construction sites would be approximately one acre in size and located within 25 meters of the nearest receptors. Although receptors in the project area may be closer than 25 meters to construction, it is the minimum distance allowed in the LST. Table 5-17 shows onsite emissions for each construction activity and location.

LST evaluation indicates that NOx, PM_{10}, and $PM_{2.5}$ emissions would be greater than maximum allowable levels during several construction phases. Impacts of these pollutants would have to be mitigated.

Table 5-17. Underground Emphasis LRT Alternative Localized Significance Thresholds (LST) for Construction Emissions

ID	Phase	Maximum Daily Onsite Emissions (lbs/day)			
		NOx	CO	PM_{10}	$PM_{2.5}$
1	Pre-Construction	**163**	65	**6**	**5**
2	Site Preparation	52	32	2	2
3	Cut & Cover Tunnel - Flower St	**307**	165	**13**	**11**
4	Cut & Cover Flower/5th Street Station	**307**	165	**13**	**11**
5	Approach to 2nd/Hope	**274**	145	**11**	**10**
6	2nd/Hope Station (SEM)	**265**	138	**11**	**10**
7	2nd/Hope Station (Cut & Cover)	**298**	159	**12**	**11**

Table 5-17. Underground Emphasis LRT Alternative Localized Significance Thresholds (LST) for Construction Emissions					
ID	Phase	Maximum Daily Onsite Emissions (lbs/day)			
		NOx	CO	PM_{10}	$PM_{2.5}$
8	TBM Launch Site	**225**	114	**9**	**8**
9	TBM Tunnel - 2nd St	**298**	159	**12**	**11**
10	Cut & Cover 2nd Street Station (Broadway option)	**307**	165	**13**	**11**
11	Cut & Cover 2nd Street Station (Los Angeles Street option)	**307**	165	**13**	**11**
12	U-Portal at 2nd/Central Streets	**265**	138	**11**	**10**
13	Improvements at 1st/Alameda Streets	**225**	114	**9**	**8**
14	Operation Systems Installation	**168**	96	**6**	**6**
Allowable Emissions		74	680	5	3

*Note: Emissions greater than threshold of significance are shown in **bold**.*

5.6.3.2 Toxic Air Contaminants

Construction of the Underground Emphasis LRT Alternative would indirectly result in increased emissions of TACs (Table 5-18). Projected emissions under this alternative were compared to existing conditions (2009) for CEQA analysis. The analysis includes a Tier 1 HRA, which compares emission levels to published screening limits. The analysis considered only acute risks because construction impacts are temporary.

Table 5-19 shows a summary of project-related emissions and Tier 1 HRA results. Diesel exhaust does not have an organic profile in CARB's speciation profiles; therefore, the analysis was restricted to inorganic emissions. Impacts from construction emissions under the Underground Emphasis LRT Alternative would not be significant under CEQA.

Table 5-18. Underground Emphasis LRT Alternative (2014-2017) Toxic Air Contaminant Construction Emissions

TAC	CAS #	Emissions (lbs/hr)			
		Alt 2a	Alt 2b	Alt 2c	Alt 2d
Arsenic	7440-38-2	0.000020	0.000021	0.000020	0.000021
Chlorine	7782-50-5	0.0015	0.0016	0.0015	0.0016
Copper	7440-50-8	0.00010	0.00010	0.00010	0.00010
Mercury	7439-97-6	0.00011	0.00012	0.00011	0.00012
Nickel	7440-02-0	0.000079	0.000078	0.000076	0.000077

Note:
Alt 2a = 2nd/Hope Streets Station (SEM) + Broadway Station
Alt 2b = 2nd/Hope Streets Station (Cut & Cover) + Broadway Station
Alt 2c = 2nd/Hope Streets Station (SEM) + Los Angeles Street Station
Alt 2d = 2nd/Hope Streets Station (Cut & Cover) + Los Angeles Street Station
Key:
TAC = toxic air contaminant
CAS = Chemical Abstracts Service
lbs/hr = pounds per hour

Table 5-19. Underground Emphasis LRT Alternative (2014-2017) Construction Health Risk Assessment

TAC	CAS #	PSL (lbs/hr)	PSI			
			Alt 2a	Alt 2b	Alt 2c	Alt 2d
Arsenic	7440-38-2	0.00010	0.20	0.21	0.20	0.21
Chlorine	7782-50-5	0.11	0.015	0.015	0.015	0.015
Copper	7440-50-8	0.050	0.0020	0.0021	0.0020	0.0021

Table 5-19. Underground Emphasis LRT Alternative (2014-2017) Construction Health Risk Assessment

TAC	CAS #	PSL (lbs/hr)	PSI			
			Alt 2a	Alt 2b	Alt 2c	Alt 2d
Mercury	7439-97-6	0.00090	0.13	0.13	0.13	0.13
Nickel	7440-02-0	0.0030	0.025	0.026	0.025	0.026
ASI			0.37	0.38	0.37	0.38
Threshold			1.0			

Key:
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
Note:
Alt 2a = 2nd/Hope Streets Station (SEM) + Broadway Station
Alt 2b = 2nd/Hope Streets Station (Cut & Cover) + Broadway Station
Alt 2c = 2nd/Hope Streets Station (SEM) + Los Angeles Street Station
Alt 2d = 2nd/Hope Streets Station (Cut & Cover) + Los Angeles Street Station

5.6.4 Cumulative Emissions

Operational emissions associated with the Underground Emphasis LRT Alternative would not exceed NEPA or CEQA significance thresholds for all criteria pollutants. It is difficult to specify what other projects will be undertaken in 2035. However, this alternative would result in substantial reductions in peak daily emissions of CO, NOx, SO_2, and PM_{10}. Impacts from emissions of these pollutants would not be cumulatively significant.

5.7 Fully Underground LRT Alternative – Little Tokyo Variation 1

With the Fully Underground LRT Alternative – Little Tokyo Variation 1, operation of the proposed light rail extension would run entirely underground. Under this alternative, opposing light rail train movements in the junction beneath the intersection of 1st and Alameda Streets would occur on the same level. This section summarizes emissions associated with this alternative.

5.7.1 Operational Emissions

Operational emissions associated with the Fully Underground LRT Alternative – Little Tokyo Variation 1 include emissions from highway traffic that would exist after this project alternative is operational. The proposed project would provide an alternative to automobile transportation in the region; therefore, it was necessary to evaluate highway traffic to assess how the proposed project would increase or decrease operational emissions from passenger vehicles.

5.7.1.1 Criteria Pollutant Emissions

Table 5-20 shows operational emissions from VMT under this alternative. Emissions of all pollutants would not be significant under a NEPA or CEQA analysis.

Table 5-20. Fully Underground LRT Alternative – Little Tokyo Variation 1 (2035) Operational Emissions

Type	Emissions (lbs/day)					
	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
CEQA Analysis						
Project Emissions	21,100	961,900	63,200	5,500	470,400	103,800
Existing Conditions	56,200	1,847,200	178,000	2,700	270,400	49,900
Increment	(35,100)	2,800	(114,800)	2,800	200,000	53,900
No Build Alt (2035).	21,100	962,500	63,300	5,600	470,700	103,800
Increment above No Build Alt.	0	(600)	(100)	(100)	(300)	0
CEQA Threshold	55	150	55	550	150	55
Significant?	No	No	No	No	No	No
NEPA Analysis						
Project Emissions	3,800	175,600	11,500	1,000	85,900	18,900
No Build Alternative	3,800	175,700	11,500	1,000	85,900	18,900

Table 5-20. Fully Underground LRT Alternative – Little Tokyo Variation 1 (2035) Operational Emissions						
Type	Emissions (lbs/day)					
	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
Increment	(2)	(112)	(7)	(1)	(55)	(12)
NEPA Threshold	10	100	10	100	70	100
Significant	No	No	No	No	No	No

Note: Negative numbers (beneficial impacts) are shown in parentheses.

5.7.1.2 Toxic Air Contaminant Emissions

The Fully Underground LRT Alternative – Little Tokyo Variation 1 would indirectly result in increased emissions of TACs from highway traffic. Emissions under this alternative were compared to existing conditions (2009) for informational purposes only. Since the EMFAC model only provides emission results for criteria pollutants, it is necessary to use published profiles of the individual compounds emitted in the exhaust to create an inventory of TACs.

Table 5-21 shows a summary of project-related emissions. The emission increment (Fully Underground LRT Alternative – Little Tokyo Variation 1) is provided for informational purposes, but is not used for significance determinations as noted in Section 3.1.2.1.

Table 5-21. Fully Underground LRT Alternative – Little Tokyo Variation 1 (2035) Toxic Air Contaminant Operational Emissions					
TAC	CAS	Emissions		Emission Increment	
		(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)
Volatile Organic Compounds					
1,3-Butadiene	106-99-0	0.011	95	(0.039)	(339)
Acetaldehyde	75-07-0	0.0048	42	(0.017)	(149)
Acrolein	107-02-8	0.0027	23	(0.010)	(83)

Table 5-21. Fully Underground LRT Alternative – Little Tokyo Variation 1 (2035) Toxic Air Contaminant Operational Emissions					
TAC	CAS	Emissions		Emission Increment	
		(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)
Benzene	71-43-2	0.052	457	(0.19)	(1,626)
Ethyl benzene	100-41-4	0.021	186	(0.075)	(661)
Formaldehyde	50-00-0	0.034	294	(0.12)	(1,048)
Methanol	67-56-1	0.0080	70	(0.029)	(250)
Methyl ethyl ketone	78-93-3	0.00038	3.3	(0.0013)	(12)
Methyl t-butyl ether	1634-04-4	0.038	336	(0.14)	(1,197)
m-Xylene	108-38-3	0.072	630	(0.26)	(2,245)
Naphthalene	91-20-3	0.00095	8.3	(0.0034)	(30)
n-Hexane	110-54-3	0.031	274	(0.11)	(977)
o-Xylene	95-47-6	0.025	219	(0.089)	(780)
Propylene	115-07-1	0.062	542	(0.22)	(1,930)
Styrene	100-42-5	0.0025	22	(0.0089)	(78)
Toluene	108-88-3	0.12	1,018	(0.41)	(3,627)
Inorganic Compounds					
Arsenic	7440-38-2	0.00026	2.3	0.000033	0.29
Cadmium	7440-43-9	0.000059	0.52	0.000008	0.066
Chlorine	7782-50-5	0.15	1,277	0.062	539
Copper	7440-50-8	0.012	105	0.0018	16

Table 5-21. Fully Underground LRT Alternative – Little Tokyo Variation 1 (2035) Toxic Air Contaminant Operational Emissions

TAC	CAS	Emissions		Emission Increment	
		(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)
Lead	7439-92-1	0.0026	22	0.00032	2.8
Manganese	7439-96-5	0.018	157	0.0026	23
Mercury	7439-97-6	0.00018	1.6	0.000023	0.20
Nickel	7440-02-0	0.0017	14	0.00052	4.5
Selenium	7782-49-2	0.000062	0.54	0.0000079	0.069

Key:
TAC = toxic air contaminant
CAS = Chemical Abstracts Service
lbs/hr = pounds per hour
lbs/yr = pounds per year

5.7.2 CO Hot Spots

This analysis completed a CO hot spots evaluation that looked at localized impacts of CO concentrations at several intersections. A screening level analysis was completed using Appendix A of the CO Protocol to determine five intersections that could be most adversely affected under this alternative. The CAL3QHC model was used to evaluate whether CO concentrations at these intersections would exceed CAAQS or NAAQS for CO concentrations. Table 5-22 shows the results of the analysis.

5.7.3 Construction Emissions

The Fully Underground LRT Alternative – Little Tokyo Variation 1 would result in temporary emissions associated with construction. Construction would occur between and including the years 2014 and 2017.

The Fully Underground LRT Alternative – Little Tokyo Variation 1 has two construction sub-alternatives. The proposed 2nd/Hope Street station could be constructed using either SEM or cut & cover. This emissions analysis evaluates both construction options.

Table 5-22. Maximum Carbon Monoxide Concentrations at Roadway Intersections Under Fully Underground LRT Alternative (2035)

ID	Intersection	Traffic CO Conc. (ppm)		Max. Conc. (ppm)		Exceeds Threshold?	
		1-Hr	8-Hr	1-Hr	8-Hr	1-Hr	8-Hr
5	1st Street and Main Street	0.20	0.14	1.40	1.04	no	no
12	2nd Street and Hill Street	0.10	0.07	1.30	0.97	no	no
57	Temple Street and Main Street	0.20	0.14	1.40	1.04	no	no
58	Temple Street and Los Angeles Street	0.20	0.14	1.40	1.04	no	no
60	Temple Street and Alameda Street	0.20	0.14	1.40	1.04	no	no

Note: CO Hot Spots evaluation the same for both variations of Fully Underground LRT Alternative.

5.7.3.1 Criteria Pollutants

Regional Construction Emissions

SCAQMD requires an analysis of construction-related emissions. This analysis estimates emissions from off-road construction equipment, fugitive dust, construction worker commuting, and haul truck emissions. Table 5-23 shows construction emissions by peak day of operation.

Table 5-23. Fully Underground LRT Alternative – Little Tokyo Variation 1 (2014-2017) Maximum Daily Construction Emissions						
Location	Daily Emissions (lbs/day)					
	VOC	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
2nd/Hope 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 Station (Cut & Cover)						
Onsite	**376**	**2,670**	**1,523**	5	108	**98**
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**.*

Emissions of VOC, NOx, CO, and $PM_{2.5}$ would be significant, and mitigation measures would need to be employed.

Localized Significance Thresholds

This analysis evaluated construction emissions on a regional level and compared them to SCAQMD's LSTs. The analysis used a series of look-up tables for NOx, CO, PM_{10}, and $PM_{2.5}$. These tables show maximum allowable emission levels, which vary based on project location, size (acreage), and distance to the nearest receptor.

Most project construction sites would be approximately one acre in size and located within 25 meters of the nearest receptors. Although receptors in the project area may be closer than 25 meters to construction, it is the minimum distance allowed in the LST. Table 5-24 shows onsite emissions for each construction activity and location.

LST evaluation indicates that NOx, PM_{10}, and $PM_{2.5}$ emissions would be greater than maximum allowable levels during several construction phases. Impacts of these pollutants would have to be mitigated.

Table 5-24. Fully Underground LRT Alternative – Little Tokyo Variation 1 Localized Significance Thresholds (LST) for Construction Emissions

ID	Phase	Maximum Daily Onsite Emissions (lbs/day)			
		NOx	CO	PM_{10}	$PM_{2.5}$
1	Pre-Construction	**163**	65	**6**	**5**
2	Site Preparation	52	32	2	2
3	Cut & Cover Tunnel - Flower St	**307**	165	**13**	**11**
4	Cut & Cover Flower/5th Street Station	**307**	165	**13**	**11**
5	Approach to 2nd/Hope	**225**	114	**9**	**8**
6	2nd/Hope Streets Station (SEM)	**217**	108	**9**	**8**
7	2nd/Hope Streets Station (Cut & Cover)	**298**	159	**12**	**11**
8	TBM Launch Site	**225**	114	**9**	**8**
9	TBM Tunnel - 2nd St	**398**	159	**12**	**11**
10	Cut & Cover - 2nd/Broadway Station	**307**	165	**13**	**11**
11	Cut & Cover Tunnel from TBM	**225**	114	**9**	**8**
12	Cut & Cover 2nd/Central Ave Station	**265**	138	**11**	**10**
13	Cut & Cover to East Portal	**201**	111	**8**	**7**
14	Cut & Cover to North Portal	**275**	161	**11**	**10**
15	1st/Alameda Junction	**217**	108	**9**	**8**

Table 5-24. Fully Underground LRT Alternative – Little Tokyo Variation 1 Localized Significance Thresholds (LST) for Construction Emissions

ID	Phase	Maximum Daily Onsite Emissions (lbs/day)			
		NOx	CO	PM_{10}	$PM_{2.5}$
16	Operation Systems Installation	**168**	96	**6**	**6**
Allowable Emissions		74	680	5	3

Note: Emissions greater than threshold of significance are shown in ***bold****.*

5.7.3.2 Toxic Air Contaminants

Construction of the Fully Underground LRT Alternative – Little Tokyo Variation 1 would indirectly result in increased emissions of TACs. Projected emissions under this alternative were compared to existing conditions (2009) for CEQA analysis. The analysis includes a Tier 1 HRA, which compares emission levels to published screening limits. The analysis considered only acute risks because construction impacts are temporary.

Table 5-25 shows a summary of project-related emissions and Tier 1 HRA results. Diesel exhaust does not have an organic profile in CARB's speciation profiles; therefore, the analysis was restricted to inorganic emissions. Impacts from construction emissions under the Fully Underground LRT Alternative – Little Tokyo Variation 1 would not be significant under CEQA.

5.7.4 Cumulative Emissions

Operational emissions associated with the Fully Underground LRT Alternative - Little Tokyo Variation 1 would not exceed NEPA or CEQA significance thresholds for all criteria pollutants. It is difficult to specify what other projects will be undertaken in 2035. However, this alternative would result in substantial reductions in peak daily emissions of CO, NOx, SO_2, and PM_{10}. Impacts from emissions of these pollutants would not be cumulatively significant.

Table 5-25. Fully Underground LRT Alternative – Little Tokyo Variation 1 (2014-2017) Toxic Air Contaminant Construction Emissions and HRA						
TAC	CAS #	Emissions (lbs/hr)		PSL	PSI	
		Alt 3a	Alt 3b	(lb/hr)	Alt 3a	Alt 3b
Arsenic	7440-38-2	0.000023	0.000024	0.00010	0.23	0.24
Chlorine	7782-50-5	0.0018	0.0019	0.11	0.017	0.018
Copper	7440-50-8	0.00012	0.00012	0.050	0.0024	0.0025
Mercury	7439-97-6	0.00013	0.00014	0.00090	0.15	0.15
Nickel	7440-02-0	0.000088	0.000091	0.0030	0.029	0.030
ASI					0.43	0.44
Threshold					1.0	

Key:
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
Note:
Alt 3a = 2nd/Hope Streets Station (SEM)
Alt 3b = 2nd/Hope Streets Station (Cut & Cover)

5.8 Fully Underground LRT Alternative – Little Tokyo Variation 2

With the Fully Underground LRT Alternative – Little Tokyo Variation 2, operation of the proposed light rail extension would run entirely underground. Under this alternative, tracks at the proposed 2nd/Central Avenue station and the junction beneath the intersection of 1st and Alameda Streets would run on two levels. There would be two single-track portals in the median of 1st Street. This section summarizes emissions associated with this alternative.

5.8.1 Operational Emissions

Operational emissions associated with the Fully Underground LRT Alternative – Little Tokyo Variation 2 include emissions from highway traffic that would exist after this project alternative is operational. The proposed project would provide an alternative to automobile transportation in the region; therefore, it was necessary to evaluate highway traffic to assess how the proposed project would increase or decrease operational emissions from passenger vehicles.

5.8.1.1 Criteria Pollutant Emissions

Table 5-26 shows operational emissions from VMT under this alternative. Emissions of all pollutants would not be significant under a NEPA or CEQA analysis. Emissions of SO_2, PM_{10}, and $PM_{2.5}$ would exceed daily thresholds of significance under CEQA. Emissions of criteria pollutants would not exceed NEPA thresholds and would not be significant.

5.8.1.2 Toxic Air Contaminant Emissions

The Fully Underground LRT Alternative – Little Tokyo Variation 2 would indirectly result in increased emissions of TACs from highway traffic. Emissions under this alternative were compared to existing conditions (2009) for informational purposes only. Since the EMFAC model only provides emission results for criteria pollutants, it is necessary to use published profiles of the individual compounds emitted in the exhaust to create an inventory of TACs.

Table 5-26. Fully Underground LRT Alternative – Little Tokyo Variation 2 (2035) Operational Emissions

Type	Emissions (lbs/day)					
	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
CEQA Analysis						
Project Emissions	21,100	961,900	63,200	5,500	470,400	103,800
Existing Conditions	56,200	1,847,200	178,000	2,700	270,400	49,900
Increment	(35,100)	(885,300)	(114,800)	2,800	200,000	53,900
No Build Alt (2035).	21,100	962,500	63,300	5,600	470,700	103,800
Increment above No Build Alt.	0	(600)	(100)	(100)	(300)	0
CEQA Threshold	55	150	55	550	150	55

Table 5-26. Fully Underground LRT Alternative – Little Tokyo Variation 2 (2035) Operational Emissions						
Type	Emissions (lbs/day)					
	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
Significant?	No	No	No	No	No	No
NEPA Analysis						
Project Emissions	3,800	175,600	11,500	1,000	85,900	18,900
No Build Alternative	3,800	175,700	11,500	1,000	85,900	18,900
Increment	(2)	(112)	(7)	(1)	(55)	(12)
NEPA Threshold	10	100	10	100	70	100
Significant	No	No	No	No	No	No

Table 5-27 shows a summary of project-related TAC emissions. The emission increment (Fully Underground LRT Alternative – Little Tokyo Variation 2) is provided for informational purposes, but is not used for significance determinations as noted in Section 3.1.2.1.

Table 5-27. Fully Underground LRT Alternative – Little Tokyo Variation 2 (2035) Toxic Air Contaminant Operational Emissions					
TAC	CAS	Emissions		Emission Increment	
		(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)
Volatile Organic Compounds					
1,3-Butadiene	106-99-0	0.011	95	(0.039)	(339)
Acetaldehyde	75-07-0	0.0048	42	(0.017)	(149)
Acrolein	107-02-8	0.0027	23	(0.010)	(83)

Table 5-27. Fully Underground LRT Alternative – Little Tokyo Variation 2 (2035) Toxic Air Contaminant Operational Emissions					
TAC	CAS	Emissions		Emission Increment	
		(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)
Benzene	71-43-2	0.052	457	(0.19)	(1,626)
Ethyl benzene	100-41-4	0.021	186	(0.075)	(661)
Formaldehyde	50-00-0	0.034	294	(0.12)	(1,048)
Methanol	67-56-1	0.0080	70	(0.029)	(250)
Methyl ethyl ketone	78-93-3	0.00038	3.3	(0.0013)	(12)
Methyl t-butyl ether	1634-04-4	0.038	336	(0.14)	(1,197)
m-Xylene	108-38-3	0.072	630	(0.26)	(2,245)
Naphthalene	91-20-3	0.00095	8.3	(0.0034)	(30)
n-Hexane	110-54-3	0.031	274	(0.11)	(977)
o-Xylene	95-47-6	0.025	219	(0.089)	(780)
Propylene	115-07-1	0.062	542	(0.22)	(1,930)
Styrene	100-42-5	0.0025	22	(0.0089)	(78)
Toluene	108-88-3	0.12	1,018	(0.41)	(3,627)
Inorganic Compounds					
Arsenic	7440-38-2	0.00026	2.3	0.000033	0.29
Cadmium	7440-43-9	0.000059	0.52	0.000008	0.066
Chlorine	7782-50-5	0.15	1,277	0.062	539
Copper	7440-50-8	0.012	105	0.0018	16

Table 5-27. Fully Underground LRT Alternative – Little Tokyo Variation 2 (2035) Toxic Air Contaminant Operational Emissions

TAC	CAS	Emissions		Emission Increment	
		(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)
Lead	7439-92-1	0.0026	22	0.00032	2.8
Manganese	7439-96-5	0.018	157	0.0026	23
Mercury	7439-97-6	0.00018	1.6	0.000023	0.20
Nickel	7440-02-0	0.0017	14	0.00052	4.5
Selenium	7782-49-2	0.000062	0.54	0.0000079	0.069

Key:
TAC = toxic air contaminant
CAS = Chemical Abstracts Service
lbs/hr = pounds per hour
lbs/yr = pounds per year

5.8.2 CO Hot Spots

The CO Hot Spots analysis mirrors that of the Fully Underground LRT Alternative – Little Tokyo Variation 1. Table 5-22 shows the results of the analysis.

5.8.3 Construction Emissions

The Fully Underground LRT Alternative – Little Tokyo Variation 2 would result in temporary emissions associated with construction. Construction would occur between and including the years 2014 and 2017.

The Fully Underground LRT Alternative – Little Tokyo Variation 2 has two construction sub-alternatives. The proposed 2nd/Hope Street station could be constructed using either SEM or cut & cover. This emissions analysis evaluates both construction options.

5.8.3.1 Criteria Pollutants

Regional Construction Emissions

SCAQMD requires an analysis of construction-related emissions. This analysis estimates emissions from off-road construction equipment, fugitive dust, construction worker commuting, and haul truck emissions. Table 5-28 shows construction emissions by peak day of operation.

Table 5-28. Fully Underground LRT Alternative – Little Tokyo Variation 2 (2014-2017) Maximum Daily Construction Emissions

Location	Daily Emissions (lbs/day)					
	VOC	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
2nd/Hope Streets 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 Streets Station (Cut & Cover)						
Onsite	**176**	**2,670**	**1,523**	5	109	**98**
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***.

Localized Significance Thresholds

This analysis evaluated construction emissions on a regional level and compared them to SCAQMD's LSTs. The analysis used a series of look-up tables for NOx, CO, PM_{10}, and $PM_{2.5}$. These tables show maximum allowable emission levels, which vary based on project location, size (acreage), and distance to the nearest receptor.

Most project construction sites would be approximately one acre in size and located within 25 meters of the nearest receptors. Although receptors in the project area may be closer than 25 meters to construction, it is the minimum distance allowed in the LST. Table 5-29 shows onsite emissions for each construction activity and location.

Table 5-29. Fully Underground LRT Alternative – Little Tokyo Variation 2 Localized Significance Thresholds (LST) for Construction Emissions					
ID	Phase	Maximum Daily Onsite Emissions (lbs/day)			
		NOx	CO	PM_{10}	$PM_{2.5}$
1	Pre-Construction	**163**	65	**6**	**5**
2	Site Preparation	52	32	2	2
3	Cut & Cover Tunnel - Flower St	**307**	165	**13**	**11**
4	Cut & Cover Flower/5th Street Station	**307**	165	**13**	**11**
5	Approach to 2nd/Hope	**225**	114	**9**	**8**
6	2nd/Hope Streets Station (SEM)	**217**	108	**9**	**8**
7	2nd/Hope Streets Station (Cut & Cover)	**298**	159	**12**	**11**
8	TBM Launch Site	**225**	114	**9**	**8**
9	TBM Tunnel - 2nd St	**298**	159	**12**	**11**
10	Cut & Cover - 2nd/Broadway Station	**307**	165	**13**	**11**
11	Cut & Cover Tunnel from TBM	**225**	114	**9**	**8**
12	Cut & Cover 2nd/Central Ave Station	**265**	138	**11**	**10**
13	Cut & Cover to East Portal	**201**	111	**8**	**7**
14	Cut & Cover to North Portal	**275**	161	**11**	**10**
15	1st/Alameda Junction	**217**	108	**9**	**8**
16	Operation Systems Installation	**168**	96	**6**	**6**
Allowable Emissions		74	680	5	3

Note: Emissions greater than threshold of significance are shown in ***bold****.*

LST evaluation indicates that NOx, PM_{10}, and $PM_{2.5}$ emissions would be greater than maximum allowable levels during several construction phases. Impacts of these pollutants would have to be mitigated.

5.8.3.2 Toxic Air Contaminants

Construction of the Fully Underground LRT Alternative – Little Tokyo Variation 2 would indirectly result in increased emissions of TACs. Projected emissions under this alternative were compared to existing conditions (2009) for CEQA analysis. The analysis includes a Tier 1 HRA, which compares emission levels to published screening limits. The analysis considered only acute risks because construction impacts are temporary.

Table 5-30 shows a summary of project-related emissions and Tier 1 HRA results. Diesel exhaust does not have an organic profile in CARB's speciation profiles; therefore, the analysis was restricted to inorganic emissions. Impacts from construction emissions under the Fully Underground LRT Alternative – Little Tokyo Variation 2 would not be significant under CEQA.

Table 5-30. Fully Underground LRT Alternative – Little Tokyo Variation 2 (2014-2017) Toxic Air Contaminant Construction Emissions and HRA

TAC	CAS #	Emissions (lbs/hr)		PSL	PSI	
		Alt 4a	Alt 4b	(lb/hr)	Alt 4a	Alt 4b
Arsenic	7440-38-2	0.000024	0.000025	0.00010	0.24	0.25
Chlorine	7782-50-5	0.0019	0.0019	0.11	0.018	0.019
Copper	7440-50-8	0.00012	0.00012	0.050	0.0024	0.0025
Mercury	7439-97-6	0.00013	0.00014	0.00090	0.15	0.15
Nickel	7440-02-0	0.000089	0.000092	0.0030	0.030	0.031
ASI					0.43	0.45
Threshold					1.0	

Key:
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
Note:
Alt 4a = 2nd/Hope Streets Station (SEM)
Alt 4b = 2nd/Hope Streets Station (Cut & Cover)

5.8.4 Cumulative Emissions

Operational emissions associated with the Fully Underground LRT Alternative - Little Tokyo Variation 2 would not exceed NEPA or CEQA significance thresholds for all criteria pollutants. It is difficult to specify what other projects will be undertaken in 2035. However, this alternative would result in substantial reductions in peak daily emissions of CO, NOx, SO_2, and PM_{10}. Impacts from emissions of these pollutants would not be cumulatively significant.

6.0 POTENTIAL MITIGATION MEASURES

This section describes recommendations for mitigation measures that could be used to reduce significant emissions from project construction and operations.

6.1 Potential Construction Mitigation Measures

Emissions of VOC, NOx, CO, and $PM_{2.5}$ would be significant during construction for all build alternatives and emissions of PM_{10} would be significant during construction for the At-Grade Emphasis LRT Alternative. Exhaust emissions from the operation of off-road vehicles are responsible for most of the emissions during construction. As a result, reducing emissions from these sources is essential.

Off-road engines could be retrofitted with add-on control devices such as catalytic oxidizers and diesel particulate filters, which would typically reduce NOx emissions by up to 40 percent and PM_{10} emissions by 85 percent; however, it would not reduce emissions of VOC and CO. It is expected that $PM_{2.5}$ emissions would be reduced to similar levels as PM_{10}.

To control emissions of other pollutants (VOC and CO), Metro could require contractors to use to use up-to-date (2014 to 2017) equipment during project construction. It is not uncommon for old construction equipment to be used at project sites because diesel engines have long lifetimes and can last over 30 years. Engine technology has improved with time, and requiring construction contractors to use up-to-date (2014 to 2017) engines could significantly reduce emissions.

6.1.1 Regional Construction Emissions

Separate emissions were calculated to evaluate how using up-to-date engines during the year 2014 to 2017 project construction period could reduce emissions of criteria pollutants. The results of this analysis are provided in Table 6-1.

Mitigated emissions of VOC, NOx, and CO still exceed the CEQA thresholds of significance for construction and are therefore significant and unavoidable. Although the regional construction impacts remain significant, the benefits of the project override the temporary adverse effects associated with construction. The proposed Regional Connector Transit Corridor project would improve transportation in the region, helping to remove vehicles from the region's roadways. Operational emissions in the future build alternatives are less than the baseline emissions for several pollutants.

Table 6-1. Mitigated (2014-2017) Maximum Daily Construction Emissions for All Alternatives

Alternative	Mitigated Daily Emissions (lbs/day)					
	VOC	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
At-Grade Emphasis LRT Alternative	**119**	**432**	**908**	4	27	12
Underground Emphasis LRT Alternative						
SEM/Broadway	**144**	**473**	**978**	4	27	12
Cut & Cover/ Broadway	**147**	**488**	**998**	4	28	12
SEM/Los Angeles	**144**	**469**	**977**	4	27	12
Cut & Cover/Los Angeles Street	**146**	**485**	**997**	4	28	12
Fully Underground LRT Alternative – Little Tokyo Variation 1						
SEM	**189**	**602**	**1,266**	5	35	16
Cut & Cover	**193**	**626**	**1,304**	5	36	16
Fully Underground LRT Alternative – Little Tokyo Variation 2						
SEM	**188**	**601**	**1,268**	5	37	16
Cut & Cover	**193**	**626**	**1,307**	5	38	16
Threshold	75	100	550	150	150	55

Note: Emissions greater than threshold of significance are shown in ***bold.***

6.1.2 Localized Significance Thresholds

Mitigated emissions were also compared to the SCAQMD's LST to evaluate significance.

6.1.2.1 At-Grade Emphasis LRT Alternative

Table 6-2 summarizes mitigated emissions for each construction activity and site for the At-Grade Emphasis LRT Alternative.

Table 6-2. At-Grade Emphasis LRT Alternative Localized Significance Thresholds (LST) for Mitigated Construction Emissions

ID	Phase	Mitigated Maximum Daily Onsite Emissions (lbs/day)			
		NO_x	CO	PM_{10}	$PM_{2.5}$
1	Pre-Construction	14	51	<1	<1
2	Site Preparation	10	17	<1	<1
3	Cut & Cover Along Flower Street	46	110	1	1
4	Cut & Cover Flower/6th Street Station	45	107	1	1
5	U-Portal at Flower	44	103	1	1
6	Portal NE of Flower & 3rd	36	91	1	1
7	Cut & Cover 2nd/Hope Street Station	45	107	1	1
8	Portal into 2nd Street Tunnel	46	110	1	1
9	Surface Trackwork	34	84	1	1
10	Improvements at Alameda/Temple Streets	47	114	1	1
11	At-Grade Stations	13	39	<1	<1
12	Operation Systems Installation	27	82	1	1
Allowable Emissions		74	680	5	3

Mitigated emissions for each construction site are less than the maximum allowable emissions under the LST methodology. Localized emissions from mitigated construction activities are therefore less than significant for the At-Grade Emphasis LRT Alternative.

6.1.2.2 Underground Emphasis LRT Alternative

Table 6-3 provides a summary of mitigated emissions for each construction activity and site for the Underground Emphasis LRT Alternative.

Table 6-3. Underground Emphasis LRT Alternative Localized Significance Thresholds (LST) for Mitigated Construction Emissions

ID	Phase	Mitigated Maximum Daily Onsite Emissions (lbs/day)			
		NOx	CO	PM_{10}	$PM_{2.5}$
1	Pre-Construction	14	51	<1	<1
2	Site Preparation	10	18	<1	<1
3	Cut & Cover Tunnel - Flower St	58	131	1	1
4	Cut & Cover Flower/5th Street Station	58	131	1	1
5	Approach to 2nd/Hope	47	114	1	1
6	2nd/Hope Streets Station (SEM)	46	107	1	1
7	2nd/Hope Streets Station (Cut & Cover)	56	125	1	1
8	TBM Launch Site	35	87	1	1
9	TBM Tunnel - 2nd St	56	125	1	1
10	Cut & Cover 2nd Street Station (Broadway option)	58	131	1	1
11	Cut & Cover 2nd Street Station (Los Angeles Street option)	58	131	1	1
12	U-Portal at 2nd/Central Streets	46	107	1	1
13	Improvements at 1st/Alameda Streets	36	91	1	1
14	Operation Systems Installation	27	82	1	1
Allowable Emissions		74	680	5	3

Mitigated emissions for each construction site are less than the maximum allowable emissions under the LST methodology. Localized emissions from mitigated construction activities are therefore less than significant for the Underground Emphasis LRT Alternative.

6.1.2.3 Fully Underground LRT Alternative – Little Tokyo Variation 1

Table 6-4 summarizes mitigated emissions for each construction activity and site for the Fully Underground LRT Alternative – Little Tokyo Variation 1.

Table 6-4. Fully Underground LRT Alternative – Little Tokyo Variation 1 Localized Significance Thresholds (LST) for Mitigated Construction Emissions

ID	Phase	Mitigated Maximum Daily Onsite Emissions (lbs/day)			
		NOx	CO	PM_{10}	$PM_{2.5}$
1	Pre-Construction	14	51	<1	<1
2	Site Preparation	10	18	<1	<1
3	Cut & Cover Tunnel - Flower St	58	131	1	1
4	Cut & Cover Flower/5th Street Station	58	131	1	1
5	Approach to 2nd/Hope	36	94	1	1
6	2nd/Hope Streets Station (SEM)	35	88	1	1
7	2nd/Hope Streets Station (Cut & Cover)	56	125	1	1
8	TBM Launch Site	35	87	1	1
9	TBM Tunnel - 2nd St	56	125	1	1
10	Cut & Cover - 2nd/Broadway Station	58	131	1	1
11	Cut & Cover Tunnel from TBM	36	91	1	1
12	Cut & Cover 2nd/Central Ave Station	46	107	1	1
13	Cut & Cover to East Portal	36	94	1	1

Table 6-4. Fully Underground LRT Alternative – Little Tokyo Variation 1 Localized Significance Thresholds (LST) for Mitigated Construction Emissions					
ID	Phase	Mitigated Maximum Daily Onsite Emissions (lbs/day)			
		NOx	CO	PM_{10}	$PM_{2.5}$
14	Cut & Cover to North Portal	58	131	1	1
15	1st/Alameda Junction	35	88	1	1
16	Operation Systems Installation	27	82	1	1
Allowable Emissions		74	680	5	3

Mitigated emissions for each construction site are less than the maximum allowable emissions under the LST methodology. Localized emissions from mitigated construction activities are therefore less than significant for the Fully Underground LRT Alternative – Little Tokyo Variation 1.

6.1.2.4 Fully Underground LRT Alternative – Little Tokyo Variation 2

Table 6-5 summarizes mitigated emissions for each construction activity and site for the Fully Underground LRT Alternative – Little Tokyo Variation 2.

Mitigated emissions for each construction site are less than the maximum allowable emissions under the LST methodology. Localized emissions from mitigated construction activities are therefore less than significant for the Fully Underground LRT Alternative – Little Tokyo Variation 2.

6.2 Potential Operational Mitigation Measures

Operational NOx emissions for the TSM Alternative would be significant under NEPA. Use of alternative fuels for the TSM buses may offset the significance of this impact, but this will need to be confirmed through future modeling. As such, it is assumed that the TSM Alternative's NOx emissions may remain significant after mitigation. Operational emissions were not found to be significant for either CEQA or NEPA for any of the other alternatives. As a result, no further mitigation measures are required for operational emissions.

Table 6-5. Fully Underground LRT Alternative – Little Tokyo Variation 2 Localized Significance Thresholds (LST) for Mitigated Construction Emissions					
ID	Phase	Mitigated Maximum Daily Onsite Emissions (lbs/day)			
		NOx	CO	PM_{10}	$PM_{2.5}$
1	Pre-Construction	14	51	<1	<1
2	Site Preparation	10	18	<1	<1
3	Cut & Cover Tunnel - Flower St	58	131	2	1
4	Cut & Cover Flower/5th Street Station	58	131	1	1
5	Approach to 2nd/Hope	36	94	1	1
6	2nd/Hope Streets Station (SEM)	35	88	1	1
7	2nd/Hope Streets Station (Cut & Cover)	56	125	1	1
8	TBM Launch Site	35	87	1	1
9	TBM Tunnel - 2nd St	56	125	1	1
10	Cut & Cover - 2nd/Broadway Station	58	131	1	1
11	Cut & Cover Tunnel from TBM	36	91	1	1
12	Cut & Cover 2nd/Central Ave Station	46	107	1	1
13	Cut & Cover to East Portal	36	94	1	1
14	Cut & Cover to North Portal	58	131	1	1
15	1st/Alameda Junction	35	88	1	1
16	Operation Systems Installation	27	82	1	1
Allowable Emissions		74	680	5	3

7.0 CONCLUSIONS

This section summarizes conclusions for both NEPA and CEQA based on the air quality impact analysis results.

7.1 No Build Alternative

The No Build Alternative is used to calculate increments among future build alternatives and does not have its own NEPA threshold of significance.

7.2 TSM Alternative

Operational emissions for the TSM Alternative, including both buses and regional traffic, were found to be less than significant for CEQA and significant under NOx for NEPA. The alternative does not include any construction and therefore would have less than significant construction impacts.

7.3 At-Grade Emphasis LRT Alternative

Operational emissions for the At-Grade Emphasis LRT Alternative were less than significant for both CEQA and NEPA. Unmitigated regional construction emissions of VOC, NOx, CO, and $PM_{2.5}$ would be greater than the significance criteria under CEQA and mitigation would be necessary. Even if mitigation required up-to-date (2014 to 2017) equipment during construction, regional construction emissions would still remain significant and unavoidable.

Although regional construction emissions under the At-Grade Emphasis LRT Alternative would be significant and unavoidable, the net benefits to air quality by reducing regional VMT would override the temporary adverse impacts.

7.4 Underground Emphasis LRT Alternative

Operational emissions for the Underground Emphasis LRT Alternative were less than significant for both CEQA and NEPA. Unmitigated regional construction emissions of VOC, NOx, CO, and $PM_{2.5}$ would be greater than the significance criteria under CEQA and mitigation would be necessary. Even if mitigation required up-to-date (2014 to 2017) equipment during construction, regional construction emissions would still remain significant and unavoidable. Localized construction emissions would be less than the maximum allowable emissions under the LST methodology and therefore less than significant.

Although regional construction emissions would be significant and unavoidable, the net benefits to air quality by reducing regional VMT under the build alternative would override the temporary adverse impacts.

7.5 Fully Underground LRT Alternative

Operational emissions for the Fully Underground LRT Alternative (Little Tokyo Variations 1 and 2) were less than significant for both CEQA and NEPA. Unmitigated regional construction emissions of VOC, NOx, CO, and $PM_{2.5}$ would be greater than the significance criteria under CEQA and mitigation would be necessary. Even if mitigation required only current year (2014 to 2017) equipment during construction, regional construction emissions would remain significant and unavoidable. Localized construction emissions would be less than the maximum allowable emissions under the LST methodology and therefore less than significant.

Although regional construction emissions would be significant and unavoidable, the net benefits to air quality by reducing regional VMT would override the temporary adverse impacts.

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