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Date:	May 2, 2022
Prepared by:	Meghan Macias, TE
To:	City of San Bernardino Public Works Department
Site:	9th and Tippecanoe Street Warehouse EPD Project Number 21-148
Subject:	Vehicle Miles Traveled (VMT) Analysis

Approved By City Engineer
Azzam Jabsheh
05032022

This memo evaluates the potential vehicle miles traveled for the 9th and Tippecanoe Street Warehouse project located in the City of San Bernardino. The project is located at the southwest corner of Tippecanoe Street and 9th Street and proposes to construct a 341,200 square foot speculative warehouse building. The project site plan is shown in Figure 1. This memo provides a Vehicle Miles Traveled (VMT) analysis based on the requirements of the City of San Bernardino TIA Guidelines, August 2020.

Background

Senate Bill (SB) 743 was signed by Governor Brown in 2013 and required the Governor's Office of Planning and Research (OPR) to amend the CEQA Guidelines to provide an alternative to LOS for evaluating Transportation impacts. SB743 specified that the new criteria should promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks and a diversity of land uses. The bill also specified that delay-based level of service could no longer be considered an indicator of a significant impact on the environment. In response, Section 15064.3 was added to the CEQA Guidelines beginning January 1, 2019. Section 15064.3 - Determining the Significance of Transportation Impacts states that Vehicle Miles Traveled (VMT) is the most appropriate measure of transportation impacts and provides lead agencies with the discretion to choose the most appropriate methodology and thresholds for evaluating VMT. Section 15064.3(c) states that the provisions of the section shall apply statewide beginning on July 1, 2020.

VMT Screening Analysis

The project is located in the City of San Bernardino. The City has adopted guidelines for preparation of VMT analyses[1]. The City's TIA Guidelines provide criteria for projects that would be considered to have a less-than significant impact on VMT and therefore could be screened out from further analysis. If a project meets one of the following criteria, then the VMT impact of the project is considered less-than significant and no further analysis of VMT would be required:

1. The project is located within a Transit Priority Area (TPA).
2. The project is located in a low VMT generating area.
3. Project Type - the project is a local-serving land use or generates less than 110 daily vehicle trips.

The applicability of each criterion to the proposed project is discussed below.

Screening Criteria 1 - Transit Priority Area Screening: According to the City's guidelines, projects located in a TPA may be presumed to have a less than significant impact. The project is partially located in a TPA;

[1] City of San Bernardino, *Traffic Impact Analysis Guidelines*, August 2020.

however, the project has a FAR of less than 0.75. Therefore, the project would not satisfy the requirements of Screening Criteria 1 – TPA screening.

Screening Criteria 2 - Low VMT Area Screening: The City's guidelines include a screening threshold for residential and office projects located in a low VMT generating area. This threshold also applies to other employment-related and mixed-use land use projects that could reasonably be expected to generate VMT per resident, worker or service population that is similar to the existing land uses. Low VMT generating area is defined as traffic analysis zones with a total daily VMT/Service Population (employment plus population) that is less than the current Citywide General Plan Buildout VMT per Service Population. The project zone was evaluated using the SBCTA VMT Screening Tool. According to the screening tool, Project Zone 53805201 has a VMT/Service Population of 108.4 and the Citywide Buildout VMT/SP is 47.7. Therefore, the project zone is not considered a low VMT area and would not satisfy the requirements of Screening Criteria 2.

Screening Criteria 3 – Project Type Screening: This criterion would apply to land uses that are considered local serving, as well as projects that generate less than 110 daily vehicle trips. The project is not considered a local serving use. The project trip generation was evaluated using trip rates from the Institute of Transportation Engineers (ITE) *Trip Generation*, 11th Edition (2021). The project was analyzed using Land Use Code 154 – High-Cube Transload and Short-Term Storage Warehouse. The project trip generation is shown in Table 1. Because the project would generate 475 daily trips without conversion to PCE trips, which is more than 110 daily trips, the project would not meet Screening Criteria 3.

Because the project would not meet any of the City screening criteria, the project's impact on VMT would not be considered less than significant and an analysis of VMT would be required.

Table 1: Project Trip Generation

				AM Peak Hour			PM Peak Hour		
Land Use		**Units**	**Daily**	**In**	**Out**	**Total**	**In**	**Out**	**Total**
Trip Rates									
High-Cube Transload and Short-Term Storage[1]		TSF	1.40	0.06	0.02	0.08	0.03	0.07	0.10
Project Trip Generation									
9th & Tippecanoe Warehouse	339.600	TSF	475	21	6	27	10	24	34
Vehicle Mix[2]		***Percent[2]***							
Passenger Vehicles		79.57%	378	17	4	21	7	20	27
2-Axle truck		3.46%	16	1	0	1	0	1	1
3-Axle truck		4.64%	22	1	0	1	0	2	2
4+-Axle Trucks		12.33%	59	3	0	3	1	3	4
		100%	475	22	4	26	8	26	34
PCE Trip Generation[3]		***PCE Factor***							
Passenger Vehicles		1.0	378	17	4	21	7	20	27
2-Axle truck		2.0	32	2	0	2	0	2	2
3-Axle truck		2.5	55	3	0	3	0	5	5
4+-Axle Trucks		3.0	177	9	0	9	3	9	12
			642	31	4	35	10	36	46

TSF = Thousand Square Feet

PCE = Passenger Car Equivalent

[1] Trip rates from the Institute of Transporation Engineers, Trip Generation, 11th Edition, 2021. Land Use Code 154 - High-Cube Transload and Short-Term Storage Warehouse.

[2] Vehicle Mix from the Fontana Truck Trip Generation Study, Classification: Heavy Warehouse, City of Fontana, August 2003.

[3] Passenger Car Equivalent (PCE) factors from the City of San Bernardino TIA Guidelines, August 2020.

VMT Analysis Methodology

A VMT analysis was prepared using the City's guidelines for VMT analysis. The analysis was prepared using the San Bernardino County Transportation Analysis Model (SBTAM) hereafter referred to as "Model".

The project is located within in Traffic Analysis Zone 53805201, referred to as "Zone" hereafter. As noted in the screening discussion, the OD VMT per service population of the project zone is shown as over 127 percent of the City's General Plan VMT per service population. It is likely that this number is very high because of the fact that in the SBTAM model there is very little land use coded into the zone. The population of zone 53805201 is shown as 9 and the total employment of the zone is only 112. The zonal boundaries are from 9th Street in the north to 6th Street in the south and from Highland Creek on the west to Tippecanoe Avenue on the east. Within the zonal boundary are two existing warehouse buildings that together include more than one million square feet of industrial use and approximately 1,000 jobs. The socioeconomic data in the project zone was corrected to include the existing land use prior to the model runs, as the presence of this employment use would affect the VMT within the project zone.

The potential employment generated by the project was calculated using industrial employment per square foot from the City of San Bernardino General Plan, Appendix 5 – Methodology Report, November 1, 2005. The SF per employee for Light Industrial was used. According to this source, Light Industrial land uses would yield 1 employee per 1,030 square feet. Based on this data, the proposed project would have a total of 330 employees. The project employment (330 employees) was entered into the project Zone in both the 2016 and 2040 models.

The Model includes validated scenarios for 2016 and 2040. These scenarios have been validated using existing 2016 traffic counts. Data for years between 2016 and 2040 can be extrapolated using linear interpolation between the 2016 and 2040 model output. The model was run for the base year (2016) and future year (2040) without and with-project conditions (i.e. four full model runs). VMT was then evaluated using the Origin-Destination (OD) matrices as required by the City's guidelines. The OD matrices do not include trip purpose, but are broken down by vehicle type (i.e. passenger vehicles, light heavy-duty trucks, heavy heavy-duty trucks).

As noted under the discussion of thresholds, the City threshold is based on the OD data. To determine VMT, the OD trips were multiplied by the trip lengths to determine the VMT. The OD VMT is divided by the service population (employment plus population) to determine the OD VMT per service population.

VMT Threshold

A project would result in a significant project generated VMT impact if either of the following conditions are satisfied:

- The baseline (2022) project generated VMT per service population exceeds the City of San Bernardino General Plan Buildout VMT per service population, calculated as of 31.6 VMT per service population, or
- The cumulative project generated VMT per service population exceeds the City of San Bernardino General Plan Buildout VMT per service population, calculated as 31.6 VMT per service population.

The project's effect on VMT would be considered significant if it resulted in the following condition:

- The cumulative link-level boundary VMT per service population within the City of San Bernardino increases under the plus project condition compared to the no project condition.

Project VMT Evaluation

The VMT analysis results are shown in Tables 2 and 3. As shown in Table 2, the project would have a significant impact on VMT in the baseline condition. The year 2022 project VMT per service population would be 32.0, which is 1.25 percent above the City's threshold of 31.6. The Cumulative impact on VMT would be less than significant as the cumulative project VMT per service population would be below the Cumulative threshold.

The project's effect on VMT would not be considered significant as the Citywide roadway VMT would be reduced with the implementation of the project. The project effect on VMT is shown in Table 3.

Table 2: VMT Analysis of Project Impact

	2016	2040	2022
Project Zone VMT	51,360	40,424	48,626
TAZ 53805201 Population	9	72	25
TAZ 53805201 Employment	1,446	1,642	1,495
TAZ 53805201 Service Population	1,455	1,714	1,520
Project VMT/SP	35.3	23.6	32.0
City of San Bernardino VMT	9,348,412	11,847,266	9,973,125
City Population	221,358	248,002	228,019
City Employment	100,467	127,540	107,235
City Service Population	321,825	375,542	335,254
City VMT/SP	29.1	31.6	29.8

Baseline Threshold[1]	Baseline Proj VMT/SP	% Above/Below Threshold	Baseline VMT Impact?
31.6	32.0	1.25%	Yes

Cumulative Threshold[1]	Cumulative Proj VMT/SP	% Above/Below Threshold	Cumulative VMT Impact?
31.6	23.6	-25.36%	No

[1] The Baseline and Cumulative Thresholds of 31.6 VMT per service population are based on the City of San Bernardino General Plan Buildout VMT per service population, which is reflected in the SBTAM Year 2040 model.

Table 3: 2040 Project Effect on VMT

	Without Project	With Project	VMT Impact?
Citywide Roadway VMT	4,875,262	4,873,843	No

VMT Mitigation Analysis

The City's VMT guidelines provides several choices to consider when developing mitigation measures for VMT impacts:

- Modify the project's-built environment characteristics to reduce VMT generated by the project,
- Implement transportation demand management (TDM) measures to reduce VMT generated by the project,
- Participate in a VMT fee program and/or VMT mitigation exchange/banking program (if one exists) to reduce VMT from the project or other land uses to achieve acceptable levels.

Considering the measures recommended by City, individual project mitigation measures are recommended below to mitigate the project specific VMT impacts. The effectiveness of mitigation measures is calculated using the methodology provided in California Air Pollution Control Officers Association (CAPCOA) *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity* [2].

The CAPCOA manual includes measure T-18 – Provide Pedestrian Network Improvement. This measure is described as increasing the sidewalk coverage to improve pedestrian access. The relevant pages from the CAPCOA manual are attached.

The VMT reduction resulting from construction of additional sidewalks is calculated using the following equation: A = ((C/B)-1) x D, where A is the percent reduction in VMT, B is the existing sidewalk length in study area, C is the sidewalk length in study area with measure and D is the elasticity of household VMT with respect to the ratio of sidewalks-to-streets (constant of -0.05). The study area used for this calculation is both sides of all streets within and on the boundaries of TAZ 53805201. Figure 2 shows the location and length of all existing and future sidewalks in the study area. The project would construct sidewalk along the project frontage on 9th Street and Tippecanoe Avenue.

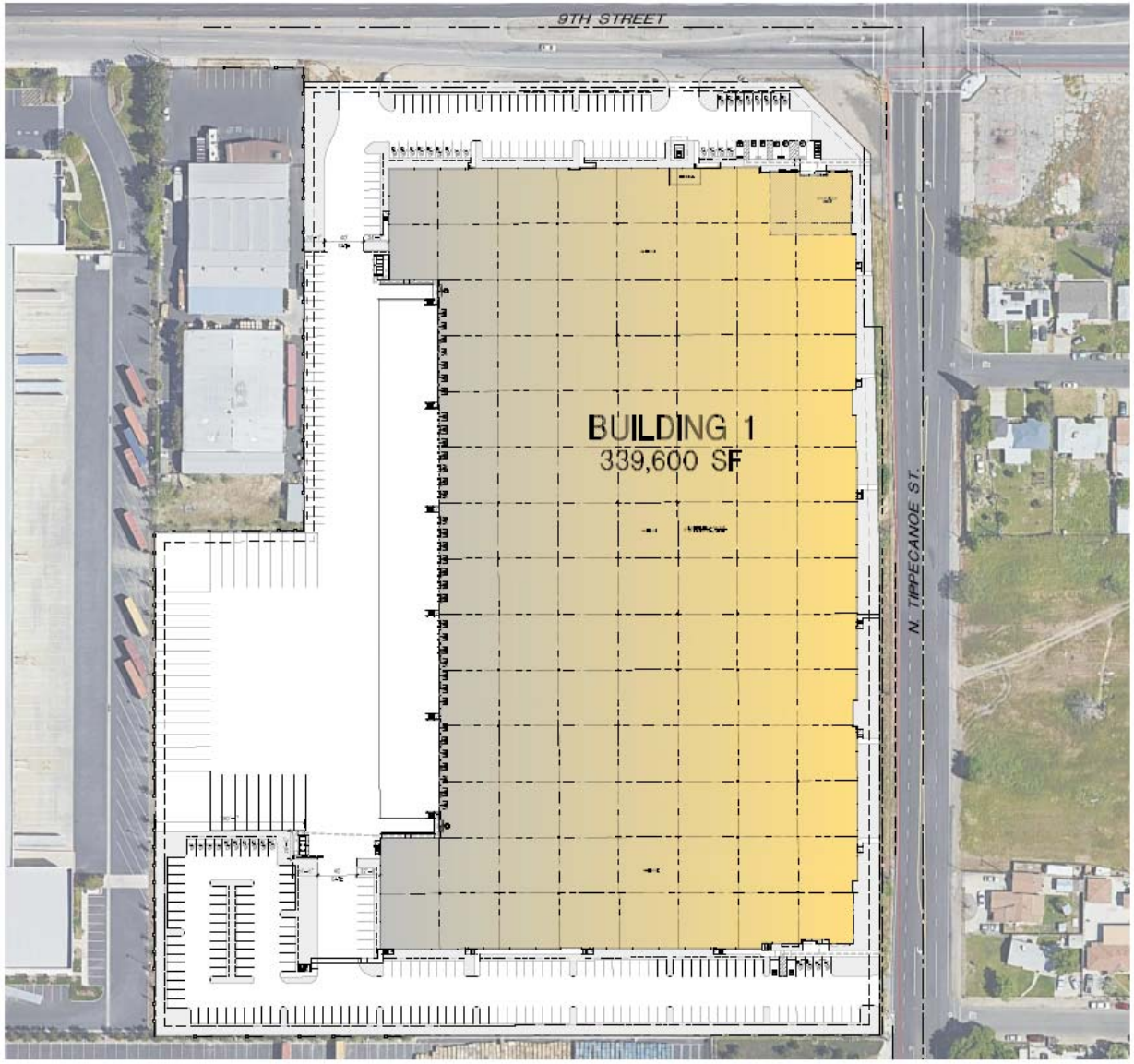
The following calculation shows the reduction in VMT: A = ((1.41 mi/1.13 mi)-1) x -0.05. The construction of sidewalks along the project frontage would result in a reduction in VMT of 1.264 percent.

As discussed in the project VMT evaluation, the project VMT/Employee is forecast to be 1.25 percent above the City significance threshold. Implementation of sidewalks along the project frontage would reduce VMT by 1.264 percent. Therefore, with implementation of this project design feature, the project VMT impacts would be reduced to less than significant

If you have any questions, please feel free to contact me at meghan@epdsolutions.com or at (949) 794-1186.

[2] California Air Pollution Control Officers Association (CAPCOA), *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity*, December 2021.

Figure 1: Conceptual Site Plan



TABULATIONS

SITE AREA		SF	ACRES
Gross		623,832	14.32
Street Dedication		0	0.00
NET SITE AREA		**623,832**	**14.32**
BUILDING AREA			
	Ground Floor Office		5,000
	Warehouse		334,600
Total Building Footprint			339,600
	Mezzanine		0
TOTAL BUILDING AREA			**339,600**
COVERAGE (75% max)			**54.4%**
FAR			**54.4%**
PARKING REQUIRED			
Office			
	0 - 2,999 sf	1/200	0
	2,001 - 7,500 sf	1/250	20
Industrial / Warehousing			
	0 - 3,000 sf	1/250	0
	3,001 - 5,000 sf	1/500	0
	5,001 - 10,000 sf	1/750	0
	10,001 - 50,000 sf	1/1000	0
	50,001 sf +	1/1250	268
TOTAL PARKING REQUIRED			**288**
PARKING PROVIDED			
Standard Stalls			286
Accessible Stalls			8
TOTAL PARKING PROVIDED			**294**
PARKING RATIO			0.87/1000
	Long Term Bicycle Stalls	5%	15
	Short Term Bicycle Stalls	5%	15
	Clean Air / Carpool Stalls	12%	35
	Electric Vehicle Charging Station	10%	29
	Dock Doors		35
	Grade Level Doors		2
	Trailer Stalls		32
LANDSCAPE		%	Area (S.F.)
Paved Surface Area			219,564
Required (15% of paved surface)		15.0%	32,935
Provided		27.4%	60,065

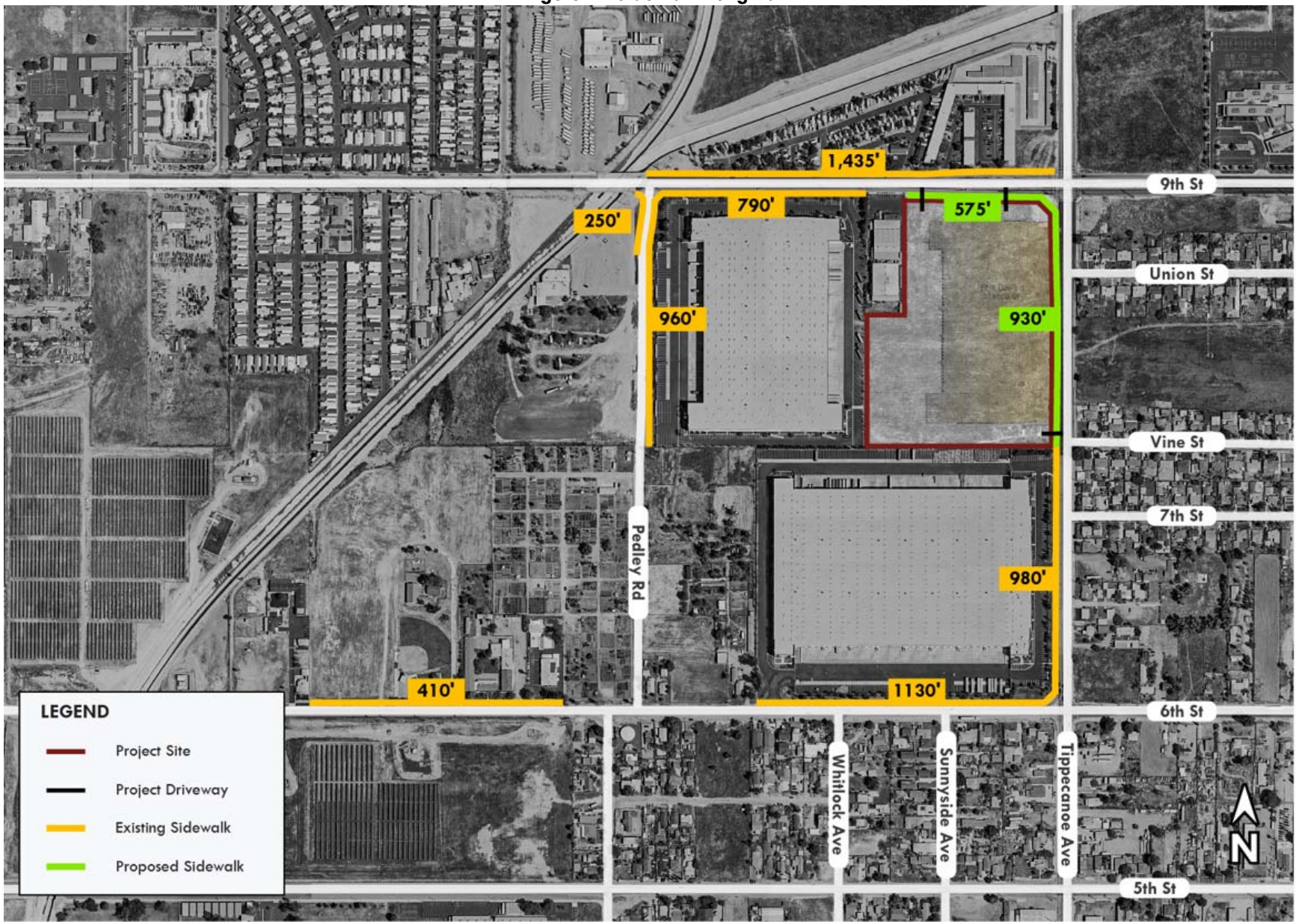
NORTH

9TH AND TIPPECANOE STREET WAREHOUSE, CITY OF SAN BERNARDINO
OAKMONT INDUSTRIAL GROUP

SCHEME A
CONCEPTUAL SITE PLAN

GAA ARCHITECTS
8911 Research Drive, Suite 200, Irvine, CA 92618
T 949.474.1775
www.GAArchitects.com

Figure 2: Sidewalk Lengths



T-18. Provide Pedestrian Network Improvement

GHG Mitigation Potential

Up to 6.4% of GHG emissions from vehicle travel in the plan/community

Co-Benefits (icon key on pg. 34)

Climate Resilience

Improving pedestrian networks increases accessibility of outdoor spaces, which can provide health benefits and thus improve community resilience. This can also improve connectivity between residents and resources that may be needed in an extreme weather event.

Health and Equity Considerations

Ensure that the improvements also include accessibility features to allow for people of all abilities to use the network safely and conveniently. Ensure that sidewalks connect to nearby community assets, such as schools, retail, and healthcare.

Measure Description

This measure will increase the sidewalk coverage to improve pedestrian access. Providing sidewalks and an enhanced pedestrian network encourages people to walk instead of drive. This mode shift results in a reduction in VMT and GHG emissions.

Subsector

Neighborhood Design

Locational Context

Urban, suburban, rural

Scale of Application

Plan/Community

Implementation Requirements

The GHG reduction of this measure is based on the VMT reduction associated with expansion of sidewalk coverage expansion, which includes not only building of new sidewalks but also improving degraded or substandard sidewalk (e.g., damaged from street tree roots). However, pedestrian network enhancements with non-quantifiable GHG reductions are encouraged to be implemented, as discussed under *Expanded Mitigation Options*.

Cost Considerations

Depending on the improvement, capital and infrastructure costs may be high. However, improvements to the pedestrian network will increase pedestrian activity, which can increase businesses patronage and provide a local economic benefit. The local municipality may achieve cost savings through a reduction of cars on the road leading to lower infrastructure and roadway maintenance costs.

Expanded Mitigation Options

When improving sidewalks, a best practice is to ensure they are contiguous and link externally with existing and planned pedestrian facilities. Barriers to pedestrian access and interconnectivity, such as walls, landscaping buffers, slopes, and unprotected crossings should be minimized. Other best practice features could include high-visibility crosswalks, pedestrian hybrid beacons, and other pedestrian signals, mid-block crossing walks, pedestrian refuge islands, speed tables, bulb-outs (curb extensions), curb ramps, signage, pavement markings, pedestrian-only connections and districts, landscaping, and other improvements to pedestrian safety (see Measure T-35, *Provide Traffic Calming Measures*).

GHG Reduction Formula

$$A = \left(\frac{C}{B} - 1\right) \times D$$

GHG Calculation Variables

ID	Variable	Value	Unit	Source
Output				
A	Percent reduction in GHG emissions from household vehicle travel in plan/community	0–6.4	%	calculated
User Inputs				
B	Existing sidewalk length in study area	[ ]	miles	user input
C	Sidewalk length in study area with measure	[ ]	miles	user input
Constants, Assumptions, and Available Defaults				
D	Elasticity of household VMT with respect to the ratio of sidewalks-to-streets	-0.05	unitless	Frank et al. 2011

Further explanation of key variables:

- (B and C) – Sidewalk length should be measured on both sides of the street. For example, if one 0.5-mile-long street has full sidewalk coverage, the sidewalk length would be 1.0 mile. If there is only sidewalk on one side of the street, the sidewalk length would be 0.5 mile. The recommended study area is 0.6 mile around the pedestrian network improvement. This represents a 6- to 10-minute walking time.
- (D) – A study found that a 0.05 percent decrease in household vehicle travel occurs for every 1 percent increase in the sidewalk-to-street ratio (Frank et al. 2011; Handy et al. 2014).

GHG Calculation Caps or Maximums

Measure Maximum

(A_{max}) The percent reduction in GHG emissions (A) is capped at 3.4 percent, which is based on the following assumptions:

- 35.2 percent of vehicle trips are short trips (2 mile or less, average of 1.29 miles) and thus could easily shift to walking (FHWA 2019).
- 64.8 percent of vehicle trips are longer trips that are unlikely to shift to walking (2 miles or more, average of 10.93 miles) (FHWA 2019).
- So $A_{max} = \frac{35.2\% \times 1.29 \text{ miles}}{64.8\% \times 10.93 \text{ miles}} = 6.4\%$

Subsector Maximum

($\sum A_{max_{T\text{-}18 \text{ through } T\text{-}22\text{-}C}} \leq 10\%$) This measure is in the Neighborhood Design subsector. This subcategory includes Measures T-18 through T-22-C. The VMT reduction from the combined implementation of all measures within this subsector is capped at 10 percent.

Example GHG Reduction Quantification

The user reduces household VMT by improving the pedestrian network in the study area. In this example, the existing sidewalk length (B) is 9 miles, and the sidewalk length with the measure (C) would be 10 miles. With these conditions, the user would reduce GHG emissions from household VMT within the study area by 0.6 percent.

$$A = \left(\frac{10 \text{ miles}}{9 \text{ miles}} - 1\right) \times -0.05 = -0.6\%$$

Quantified Co-Benefits

Improved Local Air Quality

The percent reduction in GHG emissions (A) would be the same as the percent reduction in NO_X, CO, NO_2, SO_2, and PM. Reductions in ROG emissions can be calculated by multiplying the percent reduction in GHG emissions (A) by an adjustment factor of 87 percent. See *Adjusting VMT Reductions to Emission Reductions* above for further discussion.

Energy and Fuel Savings

The percent reduction in vehicle fuel consumption would be the same as the percent reduction in GHG emissions (A).

VMT Reductions

The percent reduction in household VMT would be the same as the percent reduction in GHG emissions (A).

Improved Public Health

Users are directed to the Integrated Transport and Health Impact Model (ITHIM) (CARB et al. 2020). The ITHIM can quantify the annual change in health outcomes associated with active transportation, including deaths, years of life lost, years of living with disability, and incidence of community and individual disease.

Sources

- California Air Resources Board (CARB), California Department of Public Health (CDPH), and Nicholas Linesch Legacy Fund. 2020. Integrated Transport and Health Impact Model. Available: https://skylab.cdph.ca.gov/HealthyMobilityOptionTool-ITHIM/#Home. Accessed: September 17, 2021.
- Federal Highway Administration (FHWA). 2019. *2017 National Household Travel Survey Popular Vehicle Trip Statistics*. Available: https://nhts.ornl.gov/vehicle-trips. Accessed: January 2021.

- Frank, L., M. Greenwald, S. Kavage, and A. Devlin. 2011. *An Assessment of Urban Form and Pedestrian and Transit Improvements as an Integrated GHG Reduction Strategy*. WSDOT Research Report WA-RD 765.1, Washington State Department of Transportation. April. Available: www.wsdot.wa.gov/research/reports/fullreports/765.1.pdf. Accessed: January 2021.
- Handy, S., S. Glan-Claudia, and M. Boarnet. 2014. *Impacts of Pedestrian Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions: Policy Brief*. September. Available: https://ww2.arb.ca.gov/sites/default/files/2020-06/Impacts_of_Pedestrian_Strategies_on_Passenger_Vehicle_Use_and_Greenhouse_Gas_Emissions_Policy_Brief.pdf. Accessed: January 2021.