INITIAL STUDY

FOR THE

SAN BERNARDINO CNG FUELING STATION PROJECT

Prepared for:

City of San Bernardino
Planning Division
201 North “E” Street, 3rd Floor
San Bernardino, California 92401

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LIST OF ABBREVIATIONS AND ACROYNMS

AAQS	Ambient Air Quality Standards
AB	Assembly Bill
AD	Airport District
APE	Area of Potential Effect
APN	Assessor Parcel Number
AQMD	Air Quality Management District
AQMP	Air Quality Management Plan
bgs	below ground surface
BMPs	Best Management Practices
BRA	Biological Resources Assessment
BUOW	burrowing owl
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CalEEMod	California Emissions Estimator Model
CARB	California Air Resources Board
CBC	California Building Code
CCAR	California Climate Action Registry
CDFW	California Department of Fish & Wildlife
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNG	Compressed Natural Gas
CUPA	Certified Unified Program Agency
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibel
EPA	Environmental Protection Agency
FGC	Fish & Game Code
FTA	Federal Transit Administration
GCC	Global Climate Change
GHG	Greenhouse Gas
GP	General Plan
GSA	groundwater sustainability agency
GWP	Global Warming Potential
IL	Industrial Light
IPCC	Intergovernmental Panel on Climate Change
IS/MND	Initial Study / Mitigated Negative Declaration
ITE	Institute of Transportation Engineers
JD	Jurisdictional Delineation
LOS	Level of Service
LRA	Local Responsibility Area
LSTs	Localized Significance Thresholds

LUST	Leaking Underground Storage Tank
MBTA	Migratory Bird Treaty Act
MCLs	maximum contaminant levels
MRZ	Mineral Resource Zone
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
PCE	passenger car equivalent
RCRA	Resource Conservation and Recovery Act
RNG	Renewable Natural Gas
RTP/SCS	Regional Transportation Plan / Sustainable Communities Strategies
RWQCB	Regional Water Quality Control Board
SBDC	San Bernardino Development Code
SBCFD	San Bernardino County Fire Department
SBCUSD	San Bernardino County Unified School District
SBKR	San Bernardino kangaroo rat
SBMBI	San Manuel Band of Mission Indians
SBMWD	San Bernardino Municipal Water Department
SCAB	South Coast Air Basin
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SCG	Southern California Gas
SOI	Sphere of Influence
SRA	Source Receptor Area
SWPPP	Storm Water Pollution Prevention Program
SWRCB	State Water Resources Control Board
TACs	toxic air contaminants
TCR	Tribal Cultural Resources
TIA	Traffic Impact Analysis
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish & Wildlife Services
UST	Underground Storage Tanks
UWMP	Urban Water Management Plan
VdB	velocity in decibels
VHFHSZ	Very High Fire Hazard Severity Zone
VMT	Vehicle Miles Traveled
WQMP	Water Quality Management Plan
WRP	Water Reclamation Plant

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ENVIRONMENTAL CHECKLIST FORM

INTRODUCTION

1. Project Title: San Bernardino CNG Fueling Station

2. Lead Agency Name: City of San Bernardino
   Address: Community Development Department
   201 North "E" Street, San Bernardino, CA 92401

3. Contact Person: Mr. Michael Rosales
   Phone Number: (909) 384-7272
   E-Mail Address: Rosales_Mi@sbcity.org

4. Project Location: The proposed project is located on Central Avenue, just west of its intersection with Tippecanoe Avenue (APN: 0280-091-27-0-000, approximately 6.4 acres). Refer to Figures 1 and 2 (Regional and Site locations, respectively). Figures 3 and 4 provide an aerial photo of the site and a copy of the current site plan. The site is located in Section 14, Township 1S, Range 4W, San Bernardino Base and Meridian. The Latitude and Longitude for the project site is: 34°5'12.31" N and 117°15'43.32" W, respectively.

5. Project Sponsor's Name and Address: Clean Energy
   4675 MacArthur Court, Suite 300
   Newport Beach, CA 92660

6. General Plan Designation: Industrial

7. Zoning: Industrial Light (IL)

8. Project Description

Clean Energy has applied for a Conditional Use Permit to establish and operate a Compressed Natural Gas (CNG) vehicle fueling station which the Company terms a "Green Truck Launchpad Facility (Facility)." The purpose of Facility is to facilitate decrease in greenhouse gas emissions through ongoing efforts to replace existing diesel fleet trucks with Green Trucks (trucks that utilize low carbon Renewable Natural Gas (RNG) described below). These will be commercial fleet vehicles, with dedicated time-fill for a contracted commercial fleet customer and fast-fill dispensers for other commercial vehicles. The station will be open to vehicles owned by third party commercial customers, but this is not the primary purpose of the Facility. Clean Energy does not own or rent vehicles and this site will not function as a "truck transportation yard" because it does not include servicing or maintaining trucks. Trucks will be parked at the proposed Facility for fueling purposes only. The car parking spaces are intended for the truck drivers to park personal vehicles during working hours.

The fueling station will consist of up to four (4, 2 initially) "fast-fill" CNG dispensers and 153 (Phase 1) Truck Time-Fill Parking Spaces. At a general descriptive level the following facilities will be installed (refer to Figure 4): the vehicle fast-fill CNG dispensing station; associated control equipment pads; interconnecting piping; electrical and safety systems; modular fueling canopy; three CNG storage vessels and concrete pad; two (2) dryers; four (4) compressors; switch gear and transformer; 153 truck time-fill parking spaces (Phase 1) (asphalt parking area); 151 regular parking spaces (Phase 1); 6-foot chain length fence surrounding the property; three gates (two on Central for routine access) and one on Tippecanoe for emergency access); two bioretention basins to capture onsite storm water runoff; and landscaping (refer to Figure 5).

The refueling equipment compound encompasses approximately 72,270 square feet (sf, appx. 1.65 acres). The time-fill parking area and the vehicle parking area encompass approximately 204,882 sf (appx. 4.70 acres). Landscaping on the site encompasses approximately 36,859 sf (appx. 0.84 acre). The project envisions two phases of development. Initially, two fast-fill dispensers, the support systems and equipment, the canopy and 153 truck time-fill parking spaces and 151 regular parking spaces will be installed. During Phase 2 the project envisions installing two additional fast-fill dispensers, 62 additional truck time-fill parking spaces, and 89 additional regular parking spaces. Phase 1 will convert 25 regular parking spaces to 18 truck spaces for Phase 2. Final development is a total of 215 truck spaces and 215 regular spaces.

<u>Construction</u>

The following is a general construction sequence that will be adjusted by the applicant to conform to the specific site conditions at the time of actual construction. Clean Energy anticipates initiating construction at the end of 2021 or beginning of 2022.

1. Clear and grub,
2. Mass-grade site and road beds;
3. Installation of the onsite storm drain system;
4. Installation of public sewer system; (no public sewer system to be installed)
5. Installation of public water system; (no public water system; private irrigation only)
6. Fine grade to prepare for surface improvements;
7. Installation of building foundations;
8. Install water quality, including water quality infrastructure;
9. Install curb, gutters, sidewalks and first asphalt and concrete lift;
10. Surface improvements on adjacent roadways;
11. Complete building construction;
12. Install landscaping; place final lift of asphalt and concrete lift; and
13. Install signage and striping.

Minimal above-ground structures will be installed. It is anticipated that total Phase 1 construction will require approximately eight months to complete.

The project construction is designed to minimize Earthwork activities by matching existing drainage patterns, with approximately 5,000 C.Y. of import. It is anticipated that construction will require a maximum of 20-30 employees onsite at various times during the 8-month construction schedule. Daily truck deliveries are forecast to reach a maximum during asphalt and concrete activities of 4 to 6 deliveries per day, over a period of 2 weeks.

<u>Operations</u>

The Facility will be available to authorized fleet customers 24 hours per day, 7 days per week. The Facility will operate as a "cardlock" access operation with no dedicated onsite employees and Facility activation by card readers. This Facility will be monitored by camera and a company service representative call center 24-hours/7-days per week. Clean Energy technicians will dispatch to the site for regularly scheduled maintenance and on demand, as required. Fuel dispensing is only available by authorized card readers.

Additional project facts:

1. Daily site access will vary as contracted truck numbers fluctuate. The site is designed to accommodate up to 215 contracted trucks with 215 associated driver passenger vehicles for the secure time-fill fueling area and an undefined number of commercial vehicles for the fast-fill dispensers.
2. Six, 37-ft-long, storage bottles.
3. The project will connect with an existing natural gas line located in Tippecanoe Avenue. The natural gas will be delivered to the site in an underground pipeline and compressed at the project site.
4. Code compliant crash protection around equipment based on an agreement with the San Bernardino International Airport (Airport).

Utilities will be provided as follows:

- Water: City of San Bernardino Municipal Water Department
- Telephone: Frontier Communications
- Gas: Southern California Gas Co
- Electric: Southern California Edison
- Sewer: City of San Bernardino Municipal Water Department

9. Surrounding land uses and setting: (refer to Figure 3):

North: Existing warehouse with truck parking operations immediately to the north.
East: Tippecanoe Avenue and the San Bernardino International Airport to the east.
South: Central Avenue roadway, large ARCO service station at the SW corner of Tippecanoe and Central, with residences and small businesses to the direct south.
West: Large Warehouse

10. Other agencies whose approval is required (e.g., permits, financing approval, or participation agreement.)

- State Water Resource Control Board
- South Coast Air Quality Management District
- Santa Ana Regional Water Quality Control Board
- San Bernardino County Fire Department,
- Land Use Services-Building and Safety/Code Enforcement, and
- Department of Public Works, City of San Bernardino Code Enforcement.

11. Have California Native American tribes traditionally and cultural affiliated with the project area requested consultation pursuant to Public Resources Code section 21080.3.1? If so, has consultation begun? No. Consultation is in process.

    Note: Conducting consultation early in the CEQA process allows tribal governments, lead agencies, and project proponents to discuss the level of environmental review, identify and address potential adverse impacts to tribal cultural resources, and reduce the potential for delay and conflict in the environmental review process. (See Public Resources Code section 21083.3.2.) Information may also be available from the California Native American Heritage Commission's Sacred Lands File per Public Resources Code section 5097.96 and the California Historical Resources Information System administered by the California Office of Historic Preservation. Please also note that Public Resources Code section 21082.3(c) contains provisions specific to confidentiality.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☒ Aesthetics	☐ Agriculture and Forestry Resources	☒ Air Quality
☒ Biological Resources	☒ Cultural Resources	☒ Energy
☒ Geology / Soils	☐ Greenhouse Gas Emissions	☒ Hazards & Hazardous Materials
☒ Hydrology & Water Quality	☐ Land Use / Planning	☐ Mineral Resources
☒ Noise	☐ Population / Housing	☐ Public Services
☐ Recreation	☐ Transportation	☒ Tribal Cultural Resources
☐ Utilities / Service Systems	☐ Wildfire	☒ Mandatory Findings of Significance

DETERMINATION (To be completed by the Lead Agency)

On the basis of this initial evaluation, the following finding is made:

☐	The proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.
☒	Although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.
☐	The proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.
☐	The proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.
☐	Although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Tom Dodson & Associates
Prepared by

January 2022
Date

Lead Agency (signature)

9/21/22
Date

EVALUATION OF ENVIRONMENTAL IMPACTS:

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from "Earlier Analyses," as described in (5) below, may be cross-referenced).

5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:

   a) Earlier Analysis Used. Identify and state where they are available for review.
   b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.
   c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

8) This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.

9) The explanation of each issue should identify:

   a) the significance criteria or threshold, if any, used to evaluate each question; and
   b) the mitigation measure identified, if any, to reduce the impact to less than significance.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
I. AESTHETICS: Except as provided in Public Resources Code Section 21099, would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☒	☐	☐
c) In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning or other regulations governing scenic quality?	☐	☐	☒	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

SUBSTANTIATION: The project will install a CNG fueling station at the project site. Most of the project area will be allocated to parking area at ground level. There will be a covered (canopy) fast fill CNG dispenser area with one access on Tippecanoe Avenue and another on East Central Avenue (main entry).

a. *Less Than Significant Impact* – Adverse impacts to scenic vistas can occur in one of two ways. First, an area itself may contain existing scenic vistas that would be altered by new development. A review of the Project area determined that there are no scenic vistas located internally within the area proposed for the development of the CNG Fueling Station site. Therefore, the development of the Project is not expected to impact any important scenic vistas within the Project area. A scenic vista impact can also occur when a scenic vista can be viewed from the Project area or immediate vicinity and a proposed development may interfere with the view to a scenic vista. The City of San Bernardino General Plan identifies “Kendall Hills, San Bernardino Mountains, the hillsides adjacent to Arrowhead Springs, Lytle Creek Wash, East Twin Creeks Wash, the Santa Ana River, Badger Canyon, Bailey Canyon, and Waterman Canyon” as areas that could benefit from sensitive treatment of the land within the City (City GP, pg. 12-22). The Project is located north of, but not adjacent to the Santa Ana River in a highly industrial developed area across the street from the southwestern corner of the San Bernardino International Airport. Furthermore, the Project will develop limited above ground facilities, quick fueling station and CNG storage units, on the project site that will not cause any impacts to views of the areas identified above. Refer to Figure 5 for elevations related to the proposed project. The project site is currently vacant, containing trees and weeds and grass. Given that no identified scenic vistas are within the vicinity of the Project—as the Project location and height of the proposed new structures are outside of roadway alignments (which provide some north-south and east-west views of the San Bernardino Mountains and various hills that surround the City), implementation of the proposed development is not expected to cause any substantial effects on any important scenic vistas. This potential impact is considered a less than significant adverse aesthetic impact. No mitigation is required.

b. *Less Than Significant With Mitigation Incorporated* – The project site does not contain any important scenic resources, including, but not limited to trees, rock outcroppings, and historic buildings within a state scenic highway corridor. According to the City of San Bernardino General Plan, the majority of scenic highways are located in the mountain region to the north and east of the City. The Project footprint includes several olive trees (remains of an old olive grove), which will require removal as a result of the proposed Project. The City of San Bernardino does have a tree ordinance that protects trees. This ordinance—19.28.100—states that “In the event that more than 5 trees are to be cut down, uprooted, destroyed, or removed within a 36-month period, a permit shall first be issued by the Department" (Community Development). The proposed Project may remove more than 5 trees, and should this occur, the City will require a permit from the applicant to remove these trees. The following mitigation measure will ensure that a permit is received prior to the commencement of construction:

AES-1 The Applicant shall obtain a tree removal permit from the San Bernardino Community Development Department should development of the project site require the removal of 5 or more trees in conjunction with site development. Construction shall not commence until this permit is obtained from the City and the tree permit conditions implemented by the site developer.

No other scenic resources have been identified on the site. Therefore, with the implementation of mitigation to ensure that visual impacts due to tree removal on site are minimized, the Project would have a less than significant potential to substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway.

c. *Less Than Significant Impact* – The proposed Tippecanoe Avenue and CNG Fueling Station Project is located within an urbanized area. The proposed Project is located in a developed area, though the property across Tippecanoe to the east of the project site is not highly developed because it must remain undeveloped because it is at the end of the runway of the San Bernardino International Airport (SBIA). However, as previously stated, the adjacent property to the south, is a similar use—a standard fueling station and convenience store, and as such, the visual character of the proposed development would be similar to surrounding uses. The Project will include landscaping as required by the City for Light Industrial uses, which will ensure that the site does not substantially degrade the visual character of the site or the area. Furthermore, the Project would not develop structures greater than 20 feet in height, and as such, public views of the site to surrounding vistas would be limited, and as previously stated, development of the site would be consistent with the character of the corridor within which the Project will be developed. By developing this vacant site in accordance with City design guidelines for Light Industrial uses and in accordance with approved site development plans, the visual character of this site and its surroundings will be enhanced. Thus, with the design elements incorporated in the Project, implementation of the City's design standards will mitigate the potential aesthetic impacts to a less than significant level. No mitigation is required.

d. *Less Than Significant Impact* – The implementation of the proposed Project will create new sources of light during the operational phases of the Project. Existing sources of light in the Project area include streetlights, headlights and lighting from the adjacent roadways, lighting from the adjacent airport, and lighting from adjacent industrial, commercial, and residential uses. Light and glare from the exterior lighting, safety and security slighting, and vehicular traffic accessing the site will occur once the site is in operation. The CNG Fueling Station Project would be developed in accordance with City requirements for the Light Industrial zoning classification. Adherence to the City's Zoning Code would ensure that any building or parking lighting would not significantly impact adjacent uses. The proposed project will require lighting, both exterior and interior; the greatest source of lighting within the project site would be the canopy area. With the implementation of mandatory lighting design measures, the project would have a less than significant potential to create a new source of substantial light or glare which would adversely affect day or nighttime views in the area.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
II. AGRICULTURE AND FORESTRY RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:				
a) Convert Prime Farmland, Unique Farmland or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use or a Williamson Act contract?	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

SUBSTANTIATION

a. *No Impact* – The CNG Fueling Station Project is in an area that is urbanized. Neither the project site nor the adjacent and surrounding properties are designated for agricultural use; no agricultural activities exist in the Project area; and there is no potential for impact to any agricultural uses or values as a result of Project implementation. According to the maps prepared pursuant to the California Department of Conservation's California Important Farmland Finder as Farmland of Local Importance, no prime farmland, unique farmland, or farmland of statewide importance exists within the vicinity of the proposed Project (Figure II-1). No adverse impact to any agricultural resources would occur from implementing the proposed Project. No mitigation is required.

b. *No Impact* – There are no agricultural uses currently on the Project site or on adjacent properties. The project site is zoned for Light Industrial and the General Plan land use designation is Industrial. No potential exists for a conflict between the proposed Project and agricultural zoning or Williamson Act contracts within the Project area. No mitigation is required.

c. *No Impact* – Please refer to issues II(a) and II(b) above. The project site is in an urbanized area and neither the land use designation (Industrial) nor zoning classification (Light Industrial) supports forest land or timberland uses or designations. No potential exists for a conflict between the proposed Project and forest/timberland zoning. No mitigation is required.

d. *No Impact* – There are no forest lands within the Project area, which is because the Project area is urbanized. No potential for loss of forest land would occur if the Project is implemented. No mitigation is required.

e. *No Impact* – Because the project site and surrounding area do not support either agricultural or forestry uses and, furthermore, because the project site and environs are not designated for such uses, implementation of the proposed Project would not cause or result in the conversion of Farmland or forest land to alternative use. No adverse impact would occur. No mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
III. AIR QUALITY: Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?	☐	☒	☐	☐
c) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?	☐	☐	☒	☐

SUBSTANTIATION: The following information utilized in this section was obtained from the technical study "Air Quality and GHG Impact Analysis, CNG Fueling Station Project, San Bernardino, California" prepared by Giroux & Associates dated November 1, 2021, and provided as Appendix 1 to this document.

<u>Background</u>

Climate

The climate the eastern San Bernardino Valley, as with all of Southern California, is governed largely by the strength and location of the semi-permanent high-pressure center over the Pacific Ocean and the moderating effects of the nearby vast oceanic heat reservoir. Local climatic conditions are characterized by very warm summers, mild winters, infrequent rainfall, moderate daytime on-shore breezes, and comfortable humidity levels. Unfortunately, the same climatic conditions that create such a desirable living climate combine to severely restrict the ability of the local atmosphere to disperse the large volumes of air pollution generated by the population and industry attracted in part by the climate.

The Project will be situated in an area where the pollutants generated in coastal portions of the Los Angeles basin undergo photochemical reactions and then move inland across the project site during the daily sea breeze cycle. The resulting smog at times gives San Bernardino County some of the worst air quality in all of California. Fortunately, significant air quality improvement in the last decade suggests that healthful air quality may someday be attained despite the limited regional meteorological dispersion potential.

Air Quality Standards

Existing air quality is measured at established Southern California Air Quality Management District (SCAQMD) air quality monitoring stations. Monitored air quality is evaluated and in the context of ambient air quality standards. These standards are the levels of air quality that are considered safe, with an adequate margin of safety, to protect the public health and welfare. National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS) currently in effect are shown in Table III-1. Because the State of California had established Ambient Air Quality Standards (AAQS) several years before the federal action and because of unique air quality problems introduced by the restrictive dispersion meteorology, there is considerable difference between state and national clean air standards. Those standards currently in effect in California are shown in Table III-1. Sources and health effects of various pollutants are shown in Table III-2.

Table III-1
AMBIENT AIR QUALITY STANDARDS

Pollutant	Average Time	California Standards [1]		National Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)[8]	1 Hour	0.09 ppm (180 $\mu g/m^3$)	Ultraviolet Photometry	–	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 $\mu g/m^3$)		0.070 ppm (137 $\mu g/m^3$)		
Respirable Particulate Matter (PM10)[9]	24 Hour	50 $\mu g/m^3$	Gravimetric or Beta Attenuation	150 $\mu g/m^3$	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 $\mu g/m^3$		–		
Fine Particulate Matter (PM2.5)[9]	24 Hour	–	–	35 $\mu g/m^3$	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 $\mu g/m^3$	Gravimetric or Beta Attenuation	12.0 $\mu g/m^3$	15.0 $\mu g/m^3$	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m^3)	–	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)	–	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		–	–	
Nitrogen Dioxide (NO_2)[10]	1 Hour	0.18 ppm (339 $\mu g/m^3$)	Gas Phase Chemiluminescence	100 ppb (188 $\mu g/m^3$)	–	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 $\mu g/m^3$)		0.053 ppm (100 $\mu g/m^3$)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[11]	1 Hour	0.25 ppm (655 $\mu g/m^3$)	Ultraviolet Fluorescence	75 ppb (196 $\mu g/m^3$)	–	Ultraviolet Flourescense; Spectrophotometry (Paraosaniline Method)
	3 Hour	–		–	0.5 ppm (1300 $\mu g/m^3$)	
	24 Hour	0.04 ppm (105 $\mu g/m^3$)		0.14 ppm (for certain areas)[11]	–	
	Annual Arithmetic Mean	–		0.030 ppm (for certain areas)[11]	–	
Lead 8[12,13]	30-Day Average	1.5 $\mu g/m^3$	Atomic Absorption	–	–	–
	Calendar Quarter	–		1.5 $\mu g/m^3$ (for certain areas)[12]	Same as Primary Standard	High Volume Sampler and Atomic Absorption
	Rolling 3-Month Avg	–		0.15 $\mu g/m^3$		
Visibility Reducing Particles[14]	8 Hour	See footnote 14	Beta Attenuation and Transmittance through Filter Tape	**No Federal Standards**		
Sulfates	24 Hour	25 $\mu g/m^3$	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 $\mu g/m^3$)	Ultraviolet Fluorescence			
Vinyl Chloride[12]	24 Hour	0.01 ppm (26 $\mu g/m^3$)	Gas Chromatography			

Source: California Air Resources Board 5/4/16

Footnotes:

1 California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, suspended particulate matter – PM10, PM2.5, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2 National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight-hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24-hour standard is attained when the expected number of days per calendar year, with a 24-hour average concentration above 150 $\mu g/m^3$, is equal to or less than one. For PM2.5, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard. Contact U.S. EPA for further clarification and current federal policies.

3 Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25̊C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25̊C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4 Any equivalent procedure which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

5 National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

6 National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

7 Reference method as described by the EPA. An “equivalent method” of measurement may be used but must have a “consistent relationship to the reference method” and must be approved by the EPA.

8 On October 1, 2015, the national 8-hour ozone primary and secondary standards were lowered from 0.075 to 0.070 ppm.

9 On December 14, 2012, the national PM2.5 primary standard was lowered from 15 $\mu g/m^3$ to 12.0 $\mu g/m^3$. The existing national 24-hour PM2.5 standards (primarily and secondary) were retained at 35 $\mu g/m^3$, as was the annual secondary standard of 15 $\mu g/m^3$. The existing 24-hour PM10 standards (primarily and secondary) of 150 $\mu g/m^3$ also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.

10 To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national 1-hour standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national 1-hour standard to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

11 On June 2, 2010, a new 1-hour SO2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

Note that the 1-hour national standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the 1-hour national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

12 The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

13 The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard (1.5 $j.tg/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

14 In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

Table III-2
HEALTH EFFECTS OF MAJOR CRITERIA POLLUTANTS

Pollutants	Sources	Primary Effects
Carbon Monoxide (CO)	• Incomplete combustion of fuels and other carbon-containing substances, such as motor exhaust. • Natural events, such as decomposition of organic matter.	• Reduced tolerance for exercise. • Impairment of mental function. • Impairment of fetal development. • Death at high levels of exposure. • Aggravation of some heart diseases (angina).
Nitrogen Dioxide (NO_2)	• Motor vehicle exhaust. • High temperature stationary combustion. • Atmospheric reactions.	• Aggravation of respiratory illness. • Reduced visibility. • Reduced plant growth. • Formation of acid rain.
Ozone (O_3)	• Atmospheric reaction of organic gases with nitrogen oxides in sunlight.	• Aggravation of respiratory and cardiovascular diseases. • Irritation of eyes. • Impairment of cardiopulmonary function. • Plant leaf injury.
Lead (Pb)	• Contaminated soil.	• Impairment of blood function and nerve construction. • Behavioral and hearing problems in children.
Fine Particulate Matter (PM-10)	• Stationary combustion of solid fuels. • Construction activities. • Industrial processes. • Atmospheric chemical reactions.	• Reduced lung function. • Aggravation of the effects of gaseous pollutants. • Aggravation of respiratory and cardio respiratory diseases. • Increased cough and chest discomfort. • Soiling. • Reduced visibility.
Fine Particulate Matter (PM-2.5)	• Fuel combustion in motor vehicles, equipment, and industrial sources. • Residential and agricultural burning. • Industrial processes. • Also, formed from photochemical reactions of other pollutants, including NOx, sulfur oxides, and organics.	• Increases respiratory disease. • Lung damage. • Cancer and premature death. • Reduces visibility and results in surface soiling.
Sulfur Dioxide (SO_2)	• Combustion of sulfur-containing fossil fuels. • Smelting of sulfur-bearing metal ores. • Industrial processes.	• Aggravation of respiratory diseases (asthma, emphysema). • Reduced lung function. • Irritation of eyes. • Reduced visibility. • Plant injury. • Deterioration of metals, textiles, leather, finishes, coatings, etc.

Source: California Air Resources Board, 2002.

Baseline Air Quality

Long-term air quality monitoring is carried out by the South Coast Air Quality Management District (SCAQMD) at its Central San Bernardino monitoring station. This station measures both regional pollution levels such as dust (particulates) and smog, as well as levels of primary vehicular pollutants such as carbon monoxide. Table III-3 summarizes the last four years of the published data from the Central San Bernardino monitoring station. Ozone and particulates are seen to be the two most significant air quality concerns.

Ozone is the primary ingredient in photochemical smog. Slightly more than 16 percent of all days exceed the California one-hour standard. The 8-hour state ozone standard has been exceeded an average of 27 percent of all days in the past four years. The federal 8-hour standard is exceeded 20 percent of all days. For the last four years, ozone levels have neither improved nor gotten noticeably worse. While ozone levels are still high, they are much lower than 10 to 20 years ago. Attainment of all clean air standards in the Project vicinity is not likely to occur soon, but the severity and frequency of violations is expected to continue to slowly decline during the current decade.

In addition to gaseous air pollution concerns, San Bernardino experiences frequent violations of standards for 10-micron diameter respirable particulate matter (PM-10). High dust levels occur during Santa Ana wind conditions, as well as from the trapped accumulation of soot, roadway dust and byproducts of atmospheric chemical reactions during warm season days with poor visibility. Table 3 shows that almost 8 percent of all days in the last four years experienced a violation of the State PM-10 standard. However, the three-times less stringent federal standard has not been exceeded in the same time period.

A substantial fraction of PM-10 is comprised of ultra-small diameter particulates capable of being inhaled into deep lung tissue (PM-2.5). Peak annual PM-2.5 levels are sometimes almost as high as PM-10, which includes PM-2.5 as a sub-set. However, less than one percent of days experience a violation of the 24-hour standard of 35 $\mu g/m^3$. While many of the major ozone precursor emissions (automobiles, solvents, paints, etc.) have been substantially reduced, most major PM-10 sources (construction dust, vehicular turbulence along roadway shoulders, truck exhaust, etc.) have not been as effectively reduced. Prospects of ultimate attainment of ozone standards are better than for particulate matter. More localized pollutants such as carbon monoxide, nitrogen oxides, etc. are very low near the project site because background levels, never approach allowable levels. There is substantial excess dispersive capacity to accommodate localized vehicular air pollutants such as NOx or CO without any threat of violating applicable AAQS.

Table III-3
AIR QUALITY MONITORING SUMMARY (2017-2020)
(ESTIMATED NUMBER OF DAYS STANDARDS WERE EXCEEDED)

Pollutant/Standard	2017	2018	2019	2020
Ozone				
1-Hour > 0.09 ppm (S)	81	63	63	89
8-Hour > 0.07 ppm (S)	112	102	96	128
8- Hour > 0.075 ppm (F)	88	71	73	110
Max. 1-Hour Conc. (ppm)	0.158	0.138	0.127	0.162
Max. 8-Hour Conc. (ppm)	0.136	0.116	0.114	0.128
Carbon Monoxide				
8- Hour > 9. ppm (S,F)	0	0	0	0
Max 8-hour Conc. (ppm)	2.3	2.5	1.1	1.4
Nitrogen Dioxide				
1-Hour > 0.18 ppm (S)	0	0	0	0
Max. 1-Hour Conc. (ppm)	0.065	0.057	0.059	0.054
Respirable Particulates (PM-10)				
24-Hour > 50 $\mu g/m^3$ (S)	35/356	25/355	36/269	81/320
24-Hour > 150 $\mu g/m^3$ (F)	0/356	0/335	0/269	0/320
Max. 24-Hr. Conc. ($\mu g/m^3$)	86.	129.	112.	80.
Fine Particulates (PM-2.5)				
24-Hour > 35 $\mu g/m^3$ (F)	1/116	0/114	0/97	0/115
Max. 24-Hr. Conc. ($\mu g/m^3$)	38.2	30.1	34.8	25.7

S=State Standard
F=Federal Standard

Source: Central San Bernardino SCAQMD Air Monitoring Summary (5203)
data: www.arb.ca.gov/adam/

The U.S. EPA is responsible for setting and enforcing the NAAQS for O3, CO, NOx, SO2, PM10, PM2.5, and lead (7). The U.S. EPA has jurisdiction over emissions sources that are under the authority of the federal government including aircraft, locomotives, and emissions sources outside state waters (Outer Continental Shelf). The U.S. EPA also establishes emission standards for vehicles sold in states other than California. Automobiles sold in California must meet the stricter emission requirements of the CARB.

The Federal Clean Air Act (CAA) was first enacted in 1955, and has been amended numerous times in subsequent years (1963, 1965, 1967, 1970, 1977, and 1990). The CAA establishes the federal air quality standards, the NAAQS, and specifies future dates for achieving compliance (14). The CAA also mandates that states submit and implement State Implementation Plans (SIPs) for local areas not meeting these standards. These plans must include pollution control measures that demonstrate how the standards will be met. Substantial reductions in emissions of ROG, NOx and CO are forecast to continue throughout the next several decades. Unless new particulate control programs are implemented, PM-10 and PM-2.5 are forecast to slightly increase.

The Air Quality Management District (AQMD) adopted an updated clean air "blueprint" in August 2003. The 2003 Air Quality Management Plan (AQMP) was approved by the EPA in 2004. The AQMP outlined the air pollution measures needed to meet federal health-based standards for ozone by 2010 and for particulates (PM-10) by 2006. The 2003 AQMP was based upon the federal one-hour ozone standard which was revoked late in 2005 and replaced by an 8-hour federal standard. Because of the revocation of the hourly standard, a new air quality planning cycle was initiated.

With re-designation of the air basin as non-attainment for the 8-hour ozone standard, a new attainment plan was developed. This plan shifted most of the one-hour ozone standard attainment strategies to the 8-hour standard. As previously noted, the attainment date was to "slip" from 2010 to 2021. The updated attainment plan also includes strategies for ultimately meeting the federal PM-2.5 standard.

Because projected attainment by 2021 required control technologies that did not exist yet, the SCAQMD requested a voluntary "bump-up" from a "severe non-attainment" area to an "extreme non-attainment" designation for ozone. The extreme designation was to allow a longer time period for these technologies to develop. If attainment cannot be demonstrated within the specified deadline without relying on "black-box" measures, EPA would have been required to impose sanctions on the region had the bump-up request not been approved. In April 2010, the EPA approved the change in the non-attainment designation from "severe-17" to "extreme." This reclassification set a later attainment deadline (2024), but also required the air basin to adopt even more stringent emissions controls.

Table III-4
SOUTH COAST AIR BASIN EMISSIONS FORECASTS (EMISSIONS IN TONS/DAY)

Pollutant	2015[a]	2020[b]	2025[b]	2030[b]
NOx	357	289	266	257
VOC	400	393	393	391
PM-10	161	165	170	172
PM-2.5	67	68	70	71

[a]2015 Base Year.
[b]With current emissions reduction programs and adopted growth forecasts.
Source: California Air Resources Board, 2013 Almanac of Air Quality

AQMPs are required to be updated every three years. The 2012 AQMP was adopted in early 2013. An updated AQMP was required for completion in 2016. The 2016 AQMP was adopted by the SCAQMD Board in March, 2017, and has been submitted the California Air Resources Board for forwarding to the EPA. The 2016 AQMP acknowledges that motor vehicle emissions have been effectively controlled and that reductions in NOx, the continuing ozone problem pollutant, may need to come from major stationary sources (power plants, refineries, landfill flares, etc.). The current attainment deadlines for all federal non-attainment pollutants are now as follows:

8-hour ozone (70 ppb)	2032
Annual PM-2.5 (12 $\mu g/m^3$)	2025
8-hour ozone (75 ppb)	2024 (former standard)
1-hour ozone (120 ppb)	2023 (rescinded standard)
24-hour PM-2.5 (35 $\mu g/m^3$)	2019

The key challenge is that NOx emission levels, as a critical ozone precursor pollutant, are forecast to continue to exceed the levels that would allow the above deadlines to be met. Unless additional stringent NOx control measures are adopted and implemented, ozone attainment goals may not be met.

Air quality impacts are considered “significant” if they cause clean air standards to be violated where they are currently met, or if they “substantially” contribute to an existing violation of standards. Any substantial emissions of air contaminants for which there is no safe exposure, or nuisance emissions such as dust or odors, would also be considered a significant impact.

Appendix G of the California CEQA Guidelines offers the following five tests of air quality impact significance. A Project would have a potentially significant impact if it:

a. Conflicts with or obstructs implementation of the applicable air quality plan.
b. Results in a cumulatively considerable net increase of any criteria pollutants for which the Project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors).
c. Exposes sensitive receptors to substantial pollutant concentrations.
d. Creates objectionable odors affecting a substantial number of people.

Primary Pollutants
Air quality impacts generally occur on two scales of motion. Near an individual source of emissions or a collection of sources such as a crowded intersection or parking lot, levels of those pollutants that are emitted in their already unhealthful form will be highest. Carbon monoxide (CO) is an example of such a pollutant. Primary pollutant impacts can generally be evaluated directly in comparison to appropriate clean air standards. Violations of these standards where they are currently met, or a measurable worsening of an existing or future violation, would be considered a significant impact. Many particulates, especially fugitive dust emissions, are also primary pollutants. Because of the non-attainment status of the South Coast Air Basin (SCAB) for PM-10, an aggressive dust control program is required to control fugitive dust during Project construction.

Secondary Pollutants
Many pollutants, however, require time to transform from a more benign form to a more unhealthful contaminant. Their impact occurs regionally far from the source. Their incremental regional impact is minute on an individual basis and cannot be quantified except through complex photochemical computer models. Analysis of significance of such emissions is based upon a specified amount of emissions (pounds, tons, etc.) even though there is no way to translate those emissions directly into a corresponding ambient air quality impact.

Because of the chemical complexity of primary versus secondary pollutants, the SCAQMD has designated significant emissions levels as surrogates for evaluating regional air quality impact significance independent of chemical transformation processes. Projects with daily emissions that exceed any of the following emission thresholds are recommended by the SCAQMD to be considered significant under CEQA guidelines.

Table III-5
DAILY EMISSIONS THRESHOLDS

Pollutant	Construction	Operations
ROG	75	55
NOx	100	55
CO	550	550
PM-10	150	150
PM-2.5	55	55
SOx	150	150
Lead	3	3

Source: SCAQMD CEQA Air Quality Handbook, November, 1993 Rev.

Additional Indicators
In its CEQA Handbook, the SCAQMD also states that additional indicators should be used as screening criteria to determine the need for further analysis with respect to air quality. The additional indicators are as follows:

- Project could interfere with the attainment of the federal or state ambient air quality standards by either violating or contributing to an existing or projected air quality violation
- Project could result in population increases within the regional statistical area which would be in excess of that projected in the AQMP and in other than planned locations for the Project's build-out year.
- Project could generate vehicle trips that cause a CO hot spot.

Sensitive Receptors
The closest sensitive uses to the project site are the residences south of Central Avenue. The closest home is approximately 150 feet south of the closest trucking fuel pump. Setbacks are greater for the automotive pumps. The closest home is approximately 110 feet south of the closest site perimeter (the black top adjacent to Central Avenue).

<u>Impact Analysis</u>

a. *Less Than Significant Impact* – Projects such as the proposed San Bernardino CNG Fueling Station Project do not directly relate to the AQMP in that there are no specific air quality programs or regulations governing general development. Conformity with adopted plans, forecasts and programs relative to population, housing, employment and land use is the primary yardstick by which impact significance of planned growth is determined. At the broadest level the proposed CNG Fueling Station represents a shift in fuels used by delivery vans that can reduce air emissions relative to use of gasoline or diesel fuel. The SCAQMD, however, while acknowledging that the AQMP is a growth-accommodating document, does not favor designating regional impacts as less-than-significant just because the proposed development is consistent with regional growth projections. Air quality impact significance for the proposed Project has therefore been analyzed on a Project-specific basis. The City requires compliance with the Municipal Code for Project such as this, and the Applicant intends to meet these standards. The Project will need to meet design requirements meet the Airport Zone design requirements. The San Bernardino CNG Fueling Station Project will otherwise be consistent with the City's General Plan and Zoning Code. The proposed Project is projected to be consistent with regional planning forecasts maintained by the Southern California Association of Governments (SCAG) regional plans. The SCAQMD, however, while acknowledging that the AQMP is a growth-accommodating document, does not favor designating regional impacts as less-than-significant only because of consistency with regional growth projections. Air quality impact significance for the proposed Project has therefore been analyzed on a Project-specific basis. As the analysis of Project-related emissions provided below indicates, the proposed Project will not cause or be exposed to significant air pollution, and is, therefore, consistent with the applicable air quality plan.

b. *Less Than Significant With Mitigation Incorporated* – Air pollution emissions associated with the proposed Project would occur over both a short and long-term time period. Short-term emissions include fugitive dust from construction activities (i.e., site prep, demolition, grading, and exhaust emission) at the proposed Project site. Long-term emissions generated by future operation of the proposed Project primarily include energy consumption and trips generated by the future development.

Construction Emissions
CalEEMod was developed by the SCAQMD to provide a model by which to calculate both construction emissions and operational emissions from a variety of land use projects. It calculates both the daily maximum and annual average emissions for criteria pollutants as well as total or annual greenhouse gas (GHG) emissions.

The project construction is designed to minimize earthwork activities by matching existing drainage patterns, with approximately 5,000 cy of import. The Project was modeled as starting first quarter 2022 and ending in the first quarter of 2023.

Estimated construction emissions were modeled using CalEEMod2020.4.0 to identify maximum daily emissions for each pollutant during project construction

Table III-6
CONSTRUCTION ACTIVITY EQUIPMENT FLEET

Phase Name and Duration	Equipment
Grading (20 days)	1 Grader
	1 Dozer
	1 Excavator
	2 Crawling Tractors
	3 Loader/Backhoes
Construction (230 days)	1 Crane
	3 Loader/Backhoe
	1 Welders
	1 Generator Set
	3 Forklifts
Paving (20 days)	2 Pavers
	2 Paving Equipment
	2 Rollers

Utilizing this indicated equipment fleet and durations shown in Table III-6 the following worst-case daily construction emissions are calculated by CalEEMod and are listed in Table III-7.

Table III-7
CONSTRUCTION ACTIVITY EMISSIONS
MAXIMUM DAILY EMISSIONS (POUNDS/DAY)

Maximal Construction Emissions	ROG	NOx	CO	SO_2	PM-10	PM-2.5
2022						
Unmitigated	3.0	36.4	21.3	0.1	9.3	4.9
Mitigated	3.0	36.4	21.3	0.1	4.9	2.8
2023						
Unmitigated	1.9	15.8	19.7	0.0	1.9	1.0
Mitigated	1.9	15.8	19.7	0.0	1.9	1.0
SCAQMD Thresholds	75	100	550	150	150	55

Peak daily construction activity emissions are estimated to be below SCAQMD CEQA thresholds without the need for added mitigation. The only model-based mitigation measured applied for this Project was watering exposed dirt surfaces three times per day to minimize the generation of fugitive dust generation during grading.

Construction activities are not anticipated to cause dust emissions to exceed SCAQMD CEQA thresholds. Nevertheless, emissions minimization through enhanced dust control measures is recommended for use because of the non-attainment status of the air basin. Recommended measures include:

AIR-1 ***Fugitive Dust Control. The following measures shall be incorporated into Project plans and specifications for implementation:***

- ***Apply soil stabilizers or moisten inactive areas.***
- ***Water exposed surfaces as needed to avoid visible dust leaving the construction site (typically 2-3 times/day).***
- ***Cover all stock piles with tarps at the end of each day or as needed.***
- ***Provide water spray during loading and unloading of earthen materials.***
- ***Minimize in-out traffic from construction zone.***
- ***Cover all trucks hauling dirt, sand, or loose material and require all trucks to maintain at least two feet of freeboard.***
- ***Sweep streets daily if visible soil material is carried out from the construction site.***

Similarly, ozone precursor emissions (ROG and NOx) are calculated to be below SCAQMD CEQA thresholds. However, because of the regional non-attainment for photochemical smog, the use of reasonably available control measures for diesel exhaust is recommended. Combustion emissions control options include:

AIR-2 ***Exhaust Emissions Control. The following measures shall be incorporated into Project plans and specifications for implementation:***

- ***Utilize well-tuned off-road construction equipment.***
- ***Establish a preference for contractors using Tier 3 or better heavy equipment.***
- ***Enforce 5-minute idling limits for both on-road trucks and off-road equipment.***

With the above mitigation measures, any impacts related to construction emissions are considered less than significant. No further mitigation is required.

Operational Emissions
The project would be expected to generate approximately 1,597 daily trips using trip generation numbers provided in the Traffic Report prepared for this project. This number is in PCE equivalent where a truck is weighted a factor of 1.5 more than a passenger vehicle. Much of the site is timed fill posts, where a passenger car arrives to drive a time filled truck and then returns the truck and drives home. The 1,081 PCE time filled spots equate to 860 non PCE trips where half are trucks and half are passenger vehicles. These trucks in addition to the fast fill CNG spots total 880 trucks per day that will be fueling at the Project site.

Without knowing the mileage the trucks travel, it is difficult to determine truck emissions which are typically provided by the California Air Resources Board on a grams/mile basis. Therefore, the Project throughput of 1.6 million diesel gallons equivalent per year was used as a basis to determine total mileage.

Using total VMT (vehicle miles traveled) and gasoline consumption factors provided in the Emissions Factor Program EMFAC2021[1], the following mileage per gallon information was calculated averaging different types of trucks within the San Bernardino County region. As shown in Table III-8, an average of about 6 miles per gallon was calculated for three types of heavy trucks. Although many of the trucks projected for use at the Project site will be smaller, less polluting vehicles with greater mileage per gallon, the trucks in Table III-8 were used to represent a worst-case condition.

Table III-8
MILEAGE PER TRUCK TYPE AND FUEL TYPE YEAR 2023

EMFAC Truck Designation	Description	MPG Diesel Gas	MPG Natural Gas	Fuel Type Difference
T7 SWCV	Heavy-Heavy Duty Diesel Solid Waste Collection Truck	6.11	6.00	2%
T7 POLA	Heavy-Heavy Duty Diesel Drayage Truck near South Coast	6.18	5.99	3%
T6 Public	Medium-Heavy Duty Diesel Public Fleet Truck	6.14	5.69	8%

The fuel efficiency of CNG-powered vehicles is slightly lower than diesel fueled trucks. However, despite the small difference in efficiency for ease of calculations, emissions for both the diesel trucks, and the natural gas trucks were both assumed to average 6 miles per gallon. With an annual throughput of 1.6 million gallons this would be the equivalent of 266,667 truck miles year or 731 daily miles.

Using EMFAC2021v1.0.1 emission rates, the following Project emissions are shown in Table III-9. The comparison to diesel fueled vehicles is for information only. The Project will utilize RNG sources and as stated earlier in this report, only noncarbon-based emissions are analyzed.

Table III-9
2023 T7 POLA TRUCK DAILY EMISSIONS (LBS/DAY)

Emission Source	ROG	NOx	SO_2	PM-10	PM-2.5
Diesel Gas	6.6	80.8	0.2	0.1	0.1
Natural Gas*	1.7	43.0	0.0	0.1	0.1
SCAQMD Threshold	55	55	150	150	55

*using ICE

As shown natural gas vehicles emit much less pollutants than their diesel counterparts. Even if all project trucks were heavy duty, daily emissions would not exceed their SCAQMD operational thresholds.

[1] https://arb.ca.gov/emfac/emissions-inventory/a2ea2ceaee41c3b3ee08fb4f5c40c42f5263d079

c. *Less Than Significant Impact* – The SCAQMD has developed analysis parameters to evaluate ambient air quality on a local level in addition to the more regional emissions-based thresholds of significance. These analysis elements are called Localized Significance Thresholds (LSTs). LSTs were developed in response to Governing Board's Environmental Justice Enhancement Initiative 1-4 and the LST methodology was provisionally adopted in October 2003 and formally approved by SCAQMD's Mobile Source Committee in February 2005.

Use of an LST analysis for a Project is optional. For the proposed Project, the primary source of possible LST impact would be during construction. LSTs are applicable for a sensitive receptor where it is possible that an individual could remain for 24 hours such as a residence, hospital or convalescent facility.

LSTs are only applicable to the following criteria pollutants: oxides of nitrogen (NOx), carbon monoxide (CO), and particulate matter (PM-10 and PM-2.5). LSTs represent the maximum emissions from a Project that are not expected to cause or contribute to an exceedance of the most stringent applicable federal or state ambient air quality standard, and are developed based on the ambient concentrations of that pollutant for each source receptor area and distance to the nearest sensitive receptor.

LST screening tables are available for 25, 50, 100, 200 and 500-meter source-receptor distances. For this Project, since there is are residential uses just south of the site across E Central Avenue. The closest homes are approximately 110 feet from the closest site boundary and the most conservative 25-meter distance was modeled.

The SCAQMD has issued guidance on applying CalEEMod to LSTs. LST pollutant screening level concentration data is currently published for 1, 2 and 5-acre sites for varying distances. For this Project, because of size, the screening thresholds for a 1-acre site were used.

The following thresholds and emissions in Table III-10 are therefore determined (pounds per day):

Table III-10
LST AND PROJECT EMISSIONS (POUNDS/DAY)

LST Central San Bernardino Valley	CO	NOx	PM-10	PM-2.5
LST Threshold	972	170	7	4
Max On-Site Emissions				
2022Unmitigated	19	31	8	5
2022 Mitigated	19	31	4	3
2023 Unmitigated	16	14	1	1
2023 Mitigated	16	14	1	1

CalEEMod Output in Appendix
Only emissions occurring at the site, not from on-road travel as shown in Table 7

LSTs were compared to the maximum daily construction activities. As seen in Table III-10, with active dust suppression, mitigated emissions meet the LST for construction thresholds. As such, with the implementation of mitigation measure **AIR-1 above**, LST impacts are less than significant.

d. *Less Than Significant Impact* – Heavy-duty equipment in the proposed Project area during construction will emit odors; however, the construction activity would cease to occur over a short period of time. Land uses generally associated with odor complaints include:

- Agricultural uses (livestock and farming)
- Wastewater treatment plants
- Food processing plants
- Chemical plants

- Composting operations
- Refineries
- Landfills
- Dairies
- Fiberglass molding facilities

The proposed Project does not propose any such uses or activities that would result in potentially significant operational-source odor impacts. Potential sources of operational odors generated by the Project would include disposal of miscellaneous municipal refuse. Consistent with City requirements, all Project-generated refuse would be stored in covered containers and removed at regular intervals in compliance with solid waste regulations, thereby precluding substantial generation of odors due to temporary holding of refuse on-site. Moreover, SCAQMD Rule 402 acts to prevent occurrences of odor nuisances. No other sources of objectionable odors have been identified for the proposed Project.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
IV. BIOLOGICAL RESOURCES: Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☐	☒	☐
c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☒	☐	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☒	☐	☐
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

SUBSTANTIATION: The following information is provided based on a study titled "Biological Resources Assessment and Jurisdictional Delineation Report for Clean Energy's San Bernardino CNG Fueling Station Project" prepared by Jacobs dated October 2021, and provided as Appendix 2. The following information is abstracted from the Biological Resources Assessment (BRA):

<u>General Site Conditions</u>
The project site is situated in a heavily urbanized area of the City of San Bernardino and supports an abandoned grove of olive trees (now removed). Areas around the olive trees have been subject to weed abatement activities. Habitat on site consists of primarily of ruderal, non-native grasses including slender wild oat (*Avena barbata*), red brome (*Bromus madritensis* ssp. *rubens*), ripgut grass (*Bromus diandrus*), Australian tumbleweed (*Salsola australis*), prostrate pigweed (*Amaranthus albus*), star thistle (*Centaurea solstitialis*), prickly Russian thistle (*Salsola tragus*), and hairy-leaved sunflower (*Helianthus annuus*). Ornamental trees are found along Tippecanoe including eucalyptus trees (*Eucalyptus camaldulensis*). The site has been subject to ongoing weed abatement activities; therefore, the disturbance levels are high and due to lack of maintenance only hardy vegetation grows here.

Wildlife species observed or otherwise detected on site during the surveys included: California towhee (*Melozone fusca*), house finch (*Haemorhous mexicanus*), northern mockingbird (*Mimus polyglottos*), house sparrow (*Passer domesticus*), and killdeer (*Charadrius vociferus*). Killdeer were the predominant species, with three individuals observed beneath the shade of *Eucalyptus*; all other species were single sightings among vegetation from ornamental vegetation in the residential portion (northwest corner) of the property.

No burrows were found throughout the site including ground squirrel burrows and no evidence of predators were found on the Project site.

San Bernardino Kangaroo Rat (SBKR)
The San Bernardino Kangaroo Rat (SBKR) is one of several kangaroo rat species in its range. The habitat of the SBKR is confined to primary and secondary alluvial fan scrub habitats, with sandy soils deposited by fluvial (water) rather than aeolian (wind) processes. The past habitat losses and potential future losses prompted the emergency listing of the SBKR as an endangered species.

In general, the Project site does not contain any of the habitat elements typically associated with SBKR. The olive tree grove provided good roosting potential for great-horned owl which is a primary predator of SBKR. In addition, the site is subject to continuous weed abatement and no small mammal tracks were observed in the bare ground areas of the site.

The site is near to, but outside of, Critical Habitat for SBKR and SBKR have been documented within one-half mile of the site. For these reasons' it was initially thought that focused presence/absence surveys would be required. The site conditions however, do not provide any potential for SBKR occupation or utilization and further study into this species is not warranted or recommended. SBKR are presumed absent from this site.

Burrowing owl (BUOW)
The Burrowing owl [BUOW] is a small, ground-dwelling owl that is protected by the international treaty under the Migratory Bird Treaty Act of 1918 and by State law under the California Fish and Game Code (CDFG Code #3513 & #3503.5) as a Species of Special Concern. In southern California, BUOW can be found in grassland, shrub steppe, and desert habitat types consisting of short, sparse vegetation with few shrubs, level to gentle topography, and well-drained soils. They can also be found in agricultural areas, ruderal fields, vacant lots and pastures, and flood control facilities. Most importantly, BUOWs require underground burrows or other cavities for nesting, roosting and shelter.

The project site and immediate vicinity does not contain potentially suitable habitat for this species for the following reasons:

- *Olive groves do not provide the line of sight needed by this species.*
- *Evidence of predators (coyote, raptors and domestic dogs)*

No evidence of BUOW was found in the survey area. There was no sign of historic or current use of BUOW i.e., no BUOW pellets, feathers or whitewash, no burrows, and no ground squirrels or other fossorial animals to provide surrogate burrows. Additionally, no BUOW have been documented within a 3-mile radius of the subject parcel. Therefore, BUOW are, at the time of this report, considered absent from the site. To prevent take of BUOW that may migrate into the site between the time of this study and construction, a 30-day BUOW preconstruction survey shall be conducted.

Nesting Birds and Raptors
The property boundaries contain trees suitable for use by raptors for nesting and roosting purposes. The project site and immediate surrounding areas do contain habitat suitable for nesting birds in general, including the trees on site.

Jurisdiction Waters
There are no drainages on site. No aspect of the site presents any evidence of jurisdictional waters. None of the following indicators are present on site: riparian vegetation, facultative, facultative wet or obligate wet vegetation, harrow marks, sand bars shaped by water, racking, rilling, destruction of vegetation, defined bed and bank, distinct line between vegetation types, clear natural scour line, meander bars, mud cracks, staining, silt deposits, litter- organic debris. No jurisdictional waters occur on site.

a. *Less Than Significant With Mitigation Incorporated* – Based on the data gathered in the BRA, no Federal- or State-listed plant species were observed within the study area. In addition, no local plant species were found within the Project footprint, which is highly modified and currently sparsely vegetated. Given that the site situated in a heavily urbanized area of the City of San Bernardino and supported a grove of olive trees, special-status plant species that are known to occur in the region are not expected within the Project footprint. Habitat on site consists of primarily of ruderal, non-native grasses and ornamental trees found along Tippecanoe including eucalyptus trees (*Eucalyptus camaldulensis*). The site has been subject to ongoing weed abatement activities; therefore, the disturbance levels are high and only hardy vegetation grows here. The site is near to, but outside of, Critical Habitat for SBKR, and SBKR have been documented within ½ mile of the site. The site conditions however, do not provide any potential for SBKR occupation or utilization and further study into this species is not warranted or recommended. As such, SBKR are presumed absent from this site. There is low potential for BUOW due to the lack of existing burrows and graded soils; however, BUOW can dig their own burrows and soils near existing adjacent properties are less disturbed than the interior of the parcel. As such, there is potential for the lot to become occupied at a future date by BUOW. As such, the following mitigation measures shall be implemented to avoid any potential Project-related impacts to BUOW.

BIO-1 ***Burrowing Owl. Preconstruction presence/absence surveys for burrowing owl shall be conducted within 30 days prior to any onsite ground disturbing activity. The burrowing owl survey shall be conducted pursuant to the recommendations and guidelines established by the California Department of Fish and Wildlife. In the event this species is not identified within the Project limits, no further mitigation is required. If during the preconstruction survey, the burrowing owl if found to occupy the site, Mitigation Measure BIO-2 shall be required.***

BIO-2 ***If burrowing owls are identified during the survey period, the City shall require the Project applicant to take the following actions to offset impacts prior to ground disturbance:***

Active nests within the areas scheduled for disturbance or degradation shall be avoided from February 1 through August 31, and a minimum of 250-foot buffer shall be provided until fledging has occurred. Following fledging, owls may be passively relocated by a qualified biologist.

If impacts on occupied burrows in the non-nesting period are unavoidable, onsite passive relocation techniques may be used if approved by the CDFW to encourage owls to move to alternative burrows outside of the impact area.

If relocation of the owls is approved for the site by the CDFW, the City shall require the developer to hire a qualified biologist to prepare a plan for relocating the owls to a suitable site. The relocation plan must include all of the following:

- ***The location of the nest and owls proposed for relocation.***
- ***The location of the proposed relocation site.***
- ***The number of owls involved and the time of year when the relocation is proposed to take place.***
- ***The name and credentials of the biologist who will be retained to supervise the relocation.***
- ***The proposed method of capture and transport for the owls to the new site.***
- ***A description of site preparation at the relocation site (e.g., enhancement of existing burrows, creation of artificial burrows, one-time or long-term vegetation control).***

The field biologist determined that, of the remaining species listed as sensitive species that could occur in the area, none would be impacted by implementation of the proposed Project. Therefore, with implementation of mitigation measures BIO-1 and BIO-2 to protect BUOW, impacts under this issue are considered less than significant.

b. *Less Than Significant Impact* – Implementation of the proposed Project will not have an adverse effect on any riparian habitat or sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS. Habitat on site consists of primarily of ruderal, non-native grasses and ornamental trees found along Tippecanoe including eucalyptus trees. As stated above, the site is near to, but outside of, Critical Habitat for SBKR, and SBKR have been documented within ½ mile of the site. However, the Project will have no potential to impact this species or critical habitat thereof. Based on the field survey conducted by Jericho Systems and the information contained in Appendix 2, no significant impacts to riparian habitat or other sensitive communities are anticipated to occur as a result of implementation of the proposed Project.

c. *No Impact* – According to the data gathered by Jericho Systems in Appendix 2, no jurisdictional features subject to the Clean Water Act (CWA) or Fish and Game Commission (FGC) under the jurisdictions of the United States Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), or California Department of Fish and Wildlife (CDFW) exist within the Project area. The project site is located entirely outside of any jurisdictional areas and no permanent or temporary impacts to jurisdictional features will result from the Project. Therefore, no permits or authorizations from the USACE, RWQCB, or CDFW will be required. As such, given that no federally protected wetlands occur within the Project footprint, implementation of the proposed Project will have no potential to impact any federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means. No mitigation is required.

d. *Less Than Significant With Mitigation Incorporated* – Based on the field survey of the project site, the Project will not substantially interfere with the movement of any native resident or migratory species or with established native or migratory wildlife corridors, or impede the use of native nursery sites. However, the vegetation on site does have a potential to support nesting birds and foraging raptors such as red-tailed hawks. Furthermore, the State does protect all migratory and nesting native birds. Habitat suitable for nesting birds does exist within the project site and adjacent areas. As discussed, most birds are protected by the Migratory Bird Treaty Act (MBTA). To prevent interfering with native bird nesting, the following mitigation measure shall be implemented.

BIO-3 ***The State of California prohibits the "take" of active bird nests. To avoid an illegal take of active bird nests, any grubbing, brushing or tree removal should be conducted outside of the the State identified nesting season (Raptor nesting season is February 15 through July 31; and migratory bird nesting season is March 15 through September 1). Alternatively, the site shall be evaluated by a qualified biologist prior to the initiation of ground disturbace to determine the presence or absence of nesting birds. Active bird nests MUST be avoided during the nesting season. If an active nest is located in the Project construction area it will be flagged and a 300-foot avoidance buffer placed around it. No activity shall occur within the 300-foot buffer until the young have fledged the nest.***

Thus, with implementation of the above measure, any effects on wildlife movement or the use of wildlife nursery sites can be reduced to a less than significant impact.

e. *Less Than Significant With Mitigation Incorporated* – Based on the field survey, the proposed Project does not contain many biological resources that are protected by local policies or ordinances beyond those identified under Section I, Aesthetics. The proposed Project no longer contains several trees that were remnants of the old olive grove. The City of San Bernardino does have a tree ordinance that protects trees. This ordinance—19.28.100—states that "In the event that more than 5 trees are to be cut down, uprooted, destroyed, or removed within a 36-month period, a permit shall first be issued by the Department" (Community Development). The proposed Project will not remove more than 5 trees. Thus, the Developer will not need to obtain a permit to remove any trees. Mitigation measure **AES-1** will ensure that a permit is received prior to the commencement of construction for removal of any trees. Implementation of this mitigation measure would protect the biological resources on site. Past use and human disturbance of the site have eliminated any other biological resources that might be protected. With no further potential for conflicts with local policies or ordinances, impacts under this issue are less than significant with the implementation of mitigation.

f. *No Impact* – Implementation of the Project will not conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan. There are no applicable Habitat Conservation Plans or Natural Community Conservation Plans in effect within the City of San Bernardino. As discussed above, this site has been surveyed, and no habitat or species of concern exist that could be adversely affected by Project implementation. No further analysis is needed. No impacts are anticipated and no mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
V. CULTURAL RESOURCES: Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5?	☐	☒	☐	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☒	☐	☐
c) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☒	☐

SUBSTANTIATION: A cultural resources report has been prepared to evaluate the potential for cultural resources to occur within the project area of potential effect entitled "Historical/Archaeological Resources Survey Report: CNG Fueling Station Project, Assessor's Parcel Number 0280-091-27, City of San Bernardino, San Bernardino County, California" prepared by CRM TECH dated December 20, 2021, and provided as Appendix 3. The following summary information has been abstracted from this report. It provides an overview and findings regarding the cultural resources found within the project area.

<u>Background</u>
As a part of the environmental review process for the undertaking, a Historical/Archaeological Resources Survey Report was prepared to in compliance with the California Environmental Quality Act (CEQA). The purpose of the study is to provide the City with the necessary information and analysis to determine whether the proposed Project would cause substantial adverse changes to any "historical resources," as defined by CEQA, that may exist in or around the project area.

In order to identify such resources, CRM TECH conducted a historical/archaeological resources records search, pursued historical background research, contacted Native American representatives, and carried out an intensive-level field survey of the entire project area. The results of these research procedures indicate that an archaeological site from the late historic period, 36-013546 (CA-SBR-12596H), was previously recorded as lying partially within in the western portion of the project area. Consisting of the concrete slab foundations of a circa 1940 residence and an outbuilding, the portion of the site within the Project boundaries does not appear to meet CEQA's definition of a "historical resource."

No other potential "historical resources" were encountered during this study. When contacted by CRM TECH, the State of California Native American Heritage Commission stated that the Sacred Lands File maintained by the commission indicated the presence of unspecified Native American cultural resource(s) in the vicinity of the Project location and referred further inquiry to the San Manuel Band of Mission Indians and other local tribes. Upon further consultation, however, the San Manuel Band clarified that the project area lies between two Native American cultural resources known to the tribe but not within either of them. Therefore, the tribe concluded that the proposed Project would not have any impact on such resources.

The Historical/Archaeological Resources Survey Report made a conclusory finding of No Impact regarding cultural resources. No further cultural resources investigation is recommended for the proposed Project unless development plans undergo such changes as to include areas not covered by this study. However, if buried cultural materials are encountered during any earth-moving operations associated with the Project, all work in the immediate area should be halted or diverted until a qualified archaeologist can evaluate the nature and significance of the finds.

a&b. *Less Than Significant With Mitigation Incorporated* – CEQA establishes that "a project that may cause a substantial adverse change in the significance of a historical resource is a project that may have a significant effect on the environment" (PRC §21084.1). "Substantial adverse change," according to

PRC §5020.1(q), "means demolition, destruction, relocation, or alteration such that the significance of a historical resource would be impaired."

Per the above discussion and definition, no archaeological sites or isolates were recorded within the Project boundaries; thus, none of them requires further consideration during this study. In light of this information and pursuant to PRC §21084.1, the following conclusions have been reached for the Project:

- No historical resources within or adjacent to the Project area have any potential to be disturbed as they are not within the proposed area in which the facilities will be constructed and developed, and thus, the Project as it is currently proposed will not cause a substantial adverse change to any known historical resources.
- No further cultural resources investigation is necessary for the proposed Project unless construction plans undergo such changes as to include areas not covered by this study.

However, if buried cultural materials are discovered during any earth-moving operations associated with the Project, the following mitigation measure shall be implemented:

CUL-1 ***Should any cultural resources be encountered during construction of these facilities, earthmoving or grading activities in the immediate area of the finds shall be halted and an onsite inspection shall be performed immediately by a qualified archaeologist. Responsibility for making this determination shall be with the City's onsite inspector. The archaeological professional shall assess the find, determine its significance, and make recommendations for appropriate mitigation measures within the guidelines of the California Environmental Quality Act.***

Additionally, as part of the AB 52 consultation process, the City received a response from the San Manuel Band of Mission Indians requesting the following mitigation measures in addition to mitigation measures **TCR-1** and **TCR-2** identified under Section XVIII, Tribal Cultural Resources below:

CUL-2 ***In the event that cultural resources are discovered during project activities, all work in the immediate vicinity of the find (within a 60-foot buffer) shall cease and a qualified archaeologist meeting Secretary of Interior standards shall be hired to assess the find. Work on the other portions of the project outside of the buffered area may continue during this assessment period. Additionally, the San Manuel Band of Mission Indians Cultural Resources Department (SMBMI) shall be contacted, as detailed within TCR-1, regarding any pre-contact finds and be provided information after the archaeologist makes his/her initial assessment of the nature of the find, so as to provide Tribal input with regards to significance and treatment.***

CUL-3 ***If significant pre-contact cultural resources, as defined by CEQA (as amended, 2015), are discovered and avoidance cannot be ensured, the archaeologist shall develop a Monitoring and Treatment Plan, the drafts of which shall be provided to SMBMI for review and comment, as detailed within TCR-1. The archaeologist shall monitor the remainder of the project and implement the Plan accordingly.***

CUL-4 ***If human remains or funerary objects are encountered during any activities associated with the project, work in the immediate vicinity (within a 100-foot buffer of the find) shall cease and the County Coroner shall be contacted pursuant to State Health and Safety Code §7050.5 and that code enforced for the duration of the project.***

With the above mitigation incorporated, as well as the mitigation identified under Tribal Cultural Resources below, the potential for impacts to cultural resources will be reduced to a less than significant level. No additional mitigation is required.

c. *Less Than Significant Impact* – As noted in the discussion above, no available information suggests that human remains may occur within the Area of Potential Effect (APE) and the potential for such an occurrence is considered very low. Human remains discovered during the Project will need to be treated in accordance with the provisions of HSC §7050.5 and PRC §5097.98, which is mandatory. State law (Section 7050.5 of the Health and Safety Code) as well as local laws requires that the Police Department, County Sheriff and Coroner's Office receive notification if human remains are encountered. Compliance with these laws is considered adequate mitigation for potential impacts and no further mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
VI. ENERGY: Would the project:				
a) Result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operations?	☐	☒	☐	☐
b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	☐	☒	☐	☐

SUBSTANTIATION: The project will install a CNG fueling station at the project site. There will be a covered (canopy) fast fill CNG dispenser area and time fill dispensers at the onsite delivery vehicle parking spaces. The site has one access on Tippecanoe Avenue and another on East Central Avenue (main entry).

a. *Less Than Significant With Mitigation Incorporated* –The proposed Project consists of a CNG Fueling Station. Energy consumption encompasses many different activities. For example, construction can include the following activities: delivery of equipment and material to a site from some location (note it also requires energy to manufacture the equipment and material, such as harvesting, cutting and delivering wood from its source); employee trips to work, possibly offsite for lunch (or a visit by a catering truck), travel home, and occasionally leaving a site for an appointment or checking another job; use of equipment onsite (electric or fuel); and sometimes demolition and disposal of construction waste. The proposed Project will not employ any employees on a typical work day at the site, which results in a minimum number of trips requiring energy per day from employees. To minimize energy costs of construction debris management, mitigation has been established to require diversion of all material subject to recycling. Energy consumption by equipment will be reduced by requiring shutdowns when equipment is not in use after five minutes and ensuring equipment is being operated within proper operating parameters (tune-ups) to minimize emissions and fuel consumption. These requirements are consistent with State and regional rules and regulations. Under the construction scenario outlined above, the proposed Project will not result in wasteful, inefficient, or unnecessary energy consumption during construction.

The proposed Project will be powered by Southern California Edison (SCE) through the existing electricity distribution system located adjacent to the site. SCE will be able to supply sufficient electricity. Natural gas will be supplied by Southern California Gas from the existing natural gas line adjacent to the project site. As such, the amount of electricity and natural gas required by the Project is considered modest. However, the onsite CNG Fueling Station facilities must be constructed in conformance with a variety of existing energy efficiency regulatory requirements or guidelines including:

- Compliance California Green Building Standards Code, AKA the CAlGreen Code (Title 24, Part 11), which became effective on January 1, 2017. The purpose of the CALGreen Code is to improve public health, safety, and general welfare by enhancing the design and construction of building through the use of building concepts encouraging sustainable construction practices.
- The provisions of the CALGreen code apply to the planning, design, operation, construction, use, and occupancy of every newly construction building.
- Compliance The Building Energy Efficiency Standards would ensure that the building energy use associated with the proposed project would not be wasteful or unnecessary.
- Compliance with Indoor Water use consumption reduced through the maximum fixture water use rates.
- Compliance with diversion of construction and demolition materials from landfills.
- Compliance with SBDC Water Efficient Landscape Ordinance Chapter 83-10 – Landscaping Standards.
- Compliance with SBDC Chapter 83.07 – Glare & Outdoor Lighting.
- Compliance with AQMD Mandatory use of low-pollutant emitting finish materials.

- Compliance with AQMD Rules 431.1 and 431.2 to reduce the release of undesirable emissions.
- Compliance with diesel exhaust emissions from diesel vehicles and off-road diesel vehicle/equipment operations.
- Compliance with these regulatory requirements for operational energy use and construction energy use would not be wasteful or unnecessary use of energy.

Further, SCE is presently in compliance with State renewable energy supply requirements and SCE will supply electricity to the Project. Under the operational scenario for the proposed Project, the proposed Project will not result in wasteful, inefficient, or unnecessary energy consumption that could result in a significant adverse impact to energy issues based on compliance with the referenced laws, regulations and guidelines. No mitigation beyond those identified above are required.

b. *Less Than Significant With Mitigation Incorporated* – Based on the analysis in the preceding discussion, the proposed Project will not conflict with current State energy efficiency or electricity supply requirements or any local plans or programs for renewable energy or energy efficiency requirements. The City of San Bernardino has adopted State energy efficiency standards as part of its Municipal Code. No mitigation beyond those identified above are required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
VII. GEOLOGY AND SOILS: Would the project:				
a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:				
(i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☒	☐
(ii) Strong seismic ground shaking?	☐	☐	☒	☐
(iii) Seismic-related ground failure, including liquefaction?	☐	☒	☐	☐
(iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☒	☐	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in onsite or offsite land-slide, lateral spreading, subsidence, liquefaction or collapse?	☐	☒	☐	☐
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?	☐	☒	☐	☐
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒
f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☒	☐	☐

SUBSTANTIATION

a. Ground Rupture

Less Than Significant Impact – The Project site is located in the City of San Bernardino, which is located between several active faults, including the San Andreas Fault and the San Jacinto Faults, which are both classified as Alquist-Priolo Special Study Zones under the Alquist-Priolo Earthquake Fault Zoning Act. Figure VII-1 shows where these faults are located as indicated by the City of San Bernardino General Plan. According to Figure VII-1, the site is not located within an Alquist-Priolo Special Study Zone. Based on this information, the risk for ground rupture at the site location is low; therefore, it is not likely that future persons at the site will be subject to rupture from a known earthquake fault. Therefore, any impacts under this issue are considered less than significant; no mitigation is required.

Strong Seismic Ground Shaking

Less Than Significant Impact – As stated in the discussion above, several faults run through the City, and as with much of southern California, the proposed structures will be subject to strong seismic ground shaking impacts should any major earthquakes occur in the future, as shown on Figure VII-2, which depicts the City's General Plan Map of fault zones, faults, and type of faults that traverse through the City. As a result, and like all other development Projects in the City and throughout the Southern California Region, the proposed Project will be required to comply with all applicable seismic design standards contained in the 2019 California Building Code (CBC), including Section 1613- Earthquake Loads. Compliance with the CBC will ensure that structural integrity will be maintained in the event of an earthquake. Therefore, impacts associated with strong ground shaking will be less than significant without mitigation.

Seismic-Related Ground Failure Including Liquefaction

Less Than Significant With Mitigation Incorporated – According to the map prepared for the San Bernardino County Land Use Plan General Plan Geologic Hazard Overlays (Figure VII-3), the Project site is located in an area that is considered moderately susceptible to seismic-related ground failure, including liquefaction. The City's General Plan requires site-specific geotechnical reports to determine the site-specific liquefaction potential and possible seismic design mitigation. Therefore, the following mitigation measure will be implemented to reduce impacts under this issue:

GEO-1 Prior to initiating grading, the site developer shall provide a geotechnical evaluation of the potential liquefaction hazards at the site and, if a hazard exists at the proposed Project location, the evaluation shall define design measures that will ensure the safety of any new structures in protecting human life in the event of a regional earthquake affecting the site. The developer shall implement any design measures required for onsite structures to protect human safety.

Implementation of the above mitigation measure will reduce any potential impacts to a less than significant level and will ensure that human safety will be protected from any liquefaction hazards that may exist at the project site.

Landslides

No Impact – The project site is essentially flat, and is therefore not located in an area in which landslides are anticipated to occur. According to the map prepared for the San Bernardino County Land Use Plan General Plan Geologic Hazard Overlays (Figure VII-3), the Project site is not located in an area that is considered susceptible to landslides. Therefore, the Project will not expose people or structures to potential substantial adverse landslide effects, including the risk of loss, injury, or death involving landslides. No impacts under this issue are anticipated and no mitigation is required.

b. *Less Than Significant With Mitigation Incorporated* – Due to the existing disturbed nature of the project site, the shallow slope of the site (essentially flat), and the type of Project being proposed, a potential for soil erosion, loss of topsoil, and/or placing structures on unstable soils is generally considered less than significant. The project site is vacant with a significant amount of non-native vegetation coverage. The project site was formerly an olive grove, which has been abandoned, and therefore contains a number of damaged trees and an abundance of weed growth. City grading standards, best management practices and the Storm Water Pollution Prevention Plan (SWPPP) and Water Quality Management Plan (WQMP) are required to control potentially significant erosion hazards. The topography is generally flat with essentially minimal elevation change within the site. The Project is anticipated to require minimal cut and about 5,000 cubic yards of fill. During Project construction when soils are exposed, temporary soil erosion could occur, which could be exacerbated by rainfall. Project grading would be managed through the preparation and implementation of a SWPPP, and will be required to implement best management practices to achieve concurrent water quality controls after construction is completed and the Project is in operation. Once constructed, most of the site will be paved or covered with impervious surfaces and two small bioretention basins will capture and treat surface runoff at the site. The following mitigation measures or equivalent BMPs shall be implemented to address these issues:

GEO-2 ***Stored backfill material shall be covered with water resistant material during periods of heavy precipitation to reduce the potential for rainfall erosion of stored backfill material. If covering is not feasible, then measures such as the use of straw bales or sand bags shall be used to capture and hold eroded material on the Project site for future cleanup.***

GEO-3 ***All exposed, disturbed soil (trenches, stored backfill, etc.) shall be sprayed with water or soil binders twice a day, or more frequently if fugitive dust is observed migrating from the site within which the Project is being constructed.***

With implementation of the above mitigation measures, implementation of the SWPPP and associated BMPs, any impacts under this issue are considered less than significant.

c. *Less Than Significant With Mitigation Incorporated* – According to the San Bernardino County Land Use Plan General Plan Geologic Hazard Overlays (Figure VII-3), the Project is located within an area of moderate liquefaction susceptibility. The proposed development will involve the removal of the vegetation on site, as well as excavation for underground storage utilities, as well as for the stormwater management systems. As discussed under issue VII(a) above, liquefaction is a concern at the site, and is a concern throughout the southern portion of the City of San Bernardino. With the implementation of mitigation measure **GEO-1** above, prior to any construction a geotechnical study will be prepared and any design measures identified to increase seismic safety will be incorporated into project design. This will fulfill the requirement outlined in the City's General Plan, and will ensure that any impacts under this issue are less than significant. No further mitigation is required.

d. *Less Than Significant With Mitigation Incorporated* – According to the United States Department of Agriculture Web Soil Survey, the Project's Area of Potential Effect (APE) is underlain by Tujunga gravelly loamy sand, 0 to 9 percent slopes (Appendix 4). This soil class consists of, according to the USDA Soil Series website, Tujunga series soils. The onsite native soil is somewhat excessively drained, has negligible to low runoff, and flooding is none to frequent.[2] As previously stated, liquefaction is a concern on the site, however, with mitigation measure **GEO-1** above, any impacts from implementing the proposed Project on this site will be mitigated through the implementation of design measures incorporated into structures to protect human safety. Furthermore, expansive soils are typically clay type soils, and given that no clay type soils exist at the project site, the development of the Project will not create a substantial risk to life or property by being placed on expansive soils because none exist on the site. With implementation of mitigation measure **GEO-1** above, impacts under this issue are considered less than significant. No further mitigation is required.

e. *No Impact* – The Project does not propose any septic tanks or alternative wastewater disposal systems. Therefore, determining if the Project site soils are capable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater does not apply. No impacts are anticipated. No mitigation is required.

f. *Less Than Significant With Mitigation Incorporated* – The potential for discovering paleontological resources during development of the Project is considered not likely based on the data gathered within the Cultural Resources Report provided as Appendix 3. No unique geologic features are known or suspected to occur on or beneath the site. However, because these resources are located beneath the surface and can only be discovered as a result of ground disturbance activities, the following measure shall be implemented:

[2] https://soilseries.sc.egov.usda.gov/OSD_Docs/T/TUJUNGA.html

GEO-4 ***Should any paleontological resources be encountered during construction of these facilities, earthmoving or grading activities in the immediate area of the finds shall be halted and an onsite inspection should be performed immediately by a qualified paleontologist. Responsibility for making this determination shall be with the City's onsite inspector. The paleontological professional shall assess the find, determine its significance, and make recommendations for appropriate mitigation measures within the guidelines of the California Environmental Quality Act.***

With incorporation of this contingency mitigation, the potential for adverse impact to paleontological resources will be reduces to a less than significant level. No additional mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
VIII. GREENHOUSE GAS EMISSIONS: Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

SUBSTANTIATION: The following information utilized in this section was obtained from the technical study “Air Quality and GHG Impact Analysis, CNG Fueling Station Project, San Bernardino, California” prepared by Giroux & Associates dated November 1, 2021, and provided as Appendix 1 to this document.

a&b. *Less Than Significant Impact* –

Global Climate Change (GCC) is defined as the change in average meteorological conditions on the earth with respect to temperature, precipitation, and storms. Many scientists believe that the climate shift taking place since the industrial revolution (1900) is occurring at a quicker rate and magnitude than in the past. Scientific evidence suggests that GCC is the result of increased concentrations of greenhouse gases in the earth’s atmosphere, including carbon dioxide, methane, nitrous oxide, and fluorinated gases. Many scientists believe that this increased rate of climate change is the result of greenhouse gases resulting from human activity and industrialization over the past 200 years.

An individual Project like the Project evaluated in this GHGA cannot generate enough greenhouse gas emissions to effect a discernible change in global climate. However, the Project may participate in the potential for GCC by its incremental contribution of greenhouse gasses combined with the cumulative increase of all other sources of greenhouse gases, which when taken together constitute potential influences on GCC.

Statewide, the framework for developing the implementing regulations for AB 32 is under way. Maximum GHG reductions are expected to derive from increased vehicle fuel efficiency, from greater use of renewable energy and from increased structural energy efficiency. Additionally, through the California Climate Action Registry (CCAR now called the Climate Action Reserve), general and industry-specific protocols for assessing and reporting GHG emissions have been developed. GHG sources are categorized into direct sources (i.e., company owned) and indirect sources (i.e., not company owned). Direct sources include combustion emissions from on-and off-road mobile sources, and fugitive emissions. Indirect sources include off-site electricity generation and non-company owned mobile sources.

<u>Thresholds of Significance</u>
In response to the requirements of SB97, the State Resources Agency developed guidelines for the treatment of GHG emissions under CEQA. These new guidelines became state laws as part of Title 14 of the California Code of Regulations in March, 2010. The CEQA Appendix G guidelines were modified to include GHG as a required analysis element. A Project would have a potentially significant impact if it:

- Generates GHG emissions, directly or indirectly, that may have a significant impact on the environment, or,
- Conflicts with an applicable plan, policy or regulation adopted to reduce GHG emissions.

Section 15064.4 of the Code specifies how significance of GHG emissions is to be evaluated. The process is broken down into quantification of Project-related GHG emissions, making a determination of significance, and specification of any appropriate mitigation if impacts are found to be potentially significant. At each of these steps, the new GHG guidelines afford the lead agency with substantial flexibility.

In September 2010, the SCAQMD CEQA Significance Thresholds GHG Working Group released revisions which recommended a threshold of 3,000 MT CO_2e for all land use projects. This 3,000 MT/year recommendation has been used as a guideline for this analysis. In the absence of an adopted numerical threshold of significance, Project related GHG emissions in excess of the guideline level are presumed to trigger a requirement for enhanced GHG reduction at the Project level.

The project is assumed to require less than one year for construction. During project construction, the CalEEMod2020.4.0 computer model predicts that the construction activities will generate the annual CO_2e emissions identified in Table VIII-1.

Table VIII-1
CONSTRUCTION EMISSIONS (Metric Tons CO_2e)

2022	436.7
2023	77.1
Total	513.8
Amoritized	**17.1**

CalEEMod Output provided in appendix

SCAQMD GHG emissions policy from construction activities is to amortize emissions over a 30-year lifetime. The amortized level is also provided. GHG impacts from construction are considered individually less-than-significant.

The input assumptions for operational GHG emissions calculations, and the GHG conversion from consumption to annual regional CO_2e emissions are summarized in the CalEEMod2020.4.0 output files found in the Appendix 1 of this report. Only GHG emissions associated with the running of a CNG station were analyzed. As discussed, GHG mobile emissions are assumed to be negative by virtue of being RNG sourced. With this, the total operational and annualized construction emissions for the proposed project are identified in Table VIII-2. The project GHG emissions are considered less-than-significant.

Table VIII-2
OPERATIONAL EMISSIONS (Metric Tons CO_2e)

Consumption Source	
Area Sources	0.0
Energy Utilization	2.0
Mobile Source	na
Solid Waste Generation	1.1
Water Consumption	0.3
Construction	17.1
Total	**20.5**
Guideline Threshold	3,000

Consistency with GHG Plans, Programs and Policies

In March 2014, the San Bernardino Associated Governments and Participating San Bernardino County Cities Partnership (Partnership) created a final draft of the San Bernardino County Regional Greenhouse Gas Reduction Plan (Reduction Plan). This Reduction Plan was created in accordance to AB 32, which established a greenhouse gas limit for the state of California. The Reduction Plan seeks to create an inventory of GHG gases and develop jurisdiction-specific GHG reduction measures and baseline information that could be used by the 21 Partnership Cities of San Bernardino County, which include the City of San Bernardino.

Projects that demonstrate consistency with the strategies, actions, and emission reduction targets contained in the Reduction Plan would have a less than significant impact on climate change. The project will generate little GHG emissions as shown in Table VIII-2. The only reduction measures applicable to this project are presented below. Therefore, consistency with the Reduction Plan would result in a less than significant impact with respect to GHG emissions.

- Encourage water-efficient landscaping practices.

- Establish a goal that a certain percentage of all water used for non-potable sources (such as landscaping irrigation) be recycled wastewater.

- Exceed the waste diversion goal recommended by Assembly Bill 939 and CalGreen.

The major source of emission typically associated with most Projects are mobile source related. Because the fuel origin for this project is RNG it is automatically associated as being air quality positive. The Project, as shown in Table VIII-2, will account for a very low amount of area source, water, or waste GHG emissions. By providing a RNG fuel source for CNG based vehicles the project is considered to be GHG positive.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
IX. HAZARDS AND HAZARDOUS MATERIALS: Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☒	☐	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☒	☐	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☒	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?	☐	☐	☒	☐
f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?	☐	☐	☐	☒

SUBSTANTIATION

a&b. *Less Than Significant With Mitigation Incorporated* – During construction of proposed Project, hazardous or potentially hazardous materials will be routinely handled in small quantities on the project site. These construction hazardous materials would include gasoline, diesel fuel, lubricants, and other petroleum-based products used to operate and maintain construction equipment and vehicles; therefore, there is a potential for accidental release of petroleum products in sufficient quantity to pose a significant hazard to people or the environment. A permitted and licensed service provider will conduct the removal of such hazardous materials; any handling, transporting, use or disposal of hazardous materials would comply with all applicable federal, State, and local agencies and regulations.

Additionally, due to the potential on-site use and storage of hazardous and flammable materials during construction, the Project would also require an Emergency/Contingency Plan that would establish procedures to follow in the event of an emergency situation (such as a fire or hazardous spill). Oversight for this Plan is provided by the San Bernardino County Fire Department (SBCFD), Hazardous Materials Division, and would be reviewed annually and renewed every three years. However, in order to ensure that no accidental releases of hazardous or potentially hazardous materials occur during construction, the following mitigation measure will be incorporated into the SWPPP prepared for the Project and it can reduce such a hazard to a less than significant level.

HAZ-1 All spills or leakage of petroleum products during construction activities will be remediated in compliance with applicable state and local regulations regarding cleanup and disposal of the contaminant released. The contaminated waste will be collected and disposed of at an appropriately licensed disposal or treatment facility. This measure will be incorporated into the SWPPP prepared for the Project development and implemented during construction.

c. *No Impact* – The proposed project site is not located within one quarter mile of a school. The nearest school is located about one mile north/northeast of the project site is a Charter School: the Norton Science and Language Academy to the west of the site, and the H. Frank Dominguez Elementary School to the northwest of the site, which is part of the San Bernardino Unified School District. Based on this information, implementation of the Project will not emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school. No adverse impacts are anticipated. No additional mitigation is required.

d. *Less Than Significant Impact* – This site is flat with remnants of an abandoned olive grove, with scattered weeds and other vegetation surrounding the abandoned olive trees. The Project will not be located on a site that is included on a list of hazardous materials sites that are currently under remediation. According to the California State Water Board's GeoTracker website (consistent with Government Code Section 65962.5), which provides information regarding Leaking Underground Storage Tanks (LUST), there are no LUST or LUST cleanup sites within 2,500 feet of the project site (Figure IX-1). However, there are three remediated clean-up sites located within 2,500 feet of the project site (Figure IX-2 through IX-6). One of these sites is a LUST clean-up site, and the other two are Military clean-up sites, all of which have been remediated, and are therefore not anticipated to create a hazard that would impact construction or operation of the project site. Therefore, the proposed construction and operation of the site as the CNG Fueling Station will not create a significant hazard to the population or to the environment from their implementation. Impacts under this issue are considered less than Significant. No mitigation is required.

e. *Less Than Significant Impact* – There nearest public airport is the San Bernardino International Airport, the boundary for which is directly adjacent to the project site to the east of Tippecanoe Avenue. No private airports are located within the vicinity of the Project. According to the City of San Bernardino General Plan San Bernardino International Airport Planning Boundaries map—provided as Figure IX-7—the project site is located within the designated planning boundary. The Project will not be constructed at a height greater than that which is allowed by the FAA and the Airport. According to the Airport Layout Plan Narrative Report for the San Bernardino International Airport "Chapter 19.12 of the City of San Bernardino Development Code establishes Airport Overlay Districts. The purpose of the Airport Overlay Districts is to protect the public health and safety in the area of the airport by minimizing exposure to crash hazards and high noise levels that may be generated by the operations of an airport and to encourage future compatible development for the continued operation of the airport." The Applicant has met with the Airport operators and an agreement has been completed that will require the project to incorporate additional safety measures deemed adequate by the Airport to comply with Chapter 19.12 of the Development Code. Therefore, the Project will have a less than significant potential to cause or experience any adverse impact related to public or private airport operations. Impacts under this issue are considered less than significant based on implementation of the agreement between the Airport and Clean Energy. No mitigation is required.

f. *Less Than Significant Impact* – The proposed Project will occur entirely within the boundaries of the project site, which is located to the west of the intersection of Tippecanoe Avenue and Central Avenue. Traffic along either street will have access to the site. It is not anticipated that development of the project site would impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan because the site activities will be confined within the proposed project site. The proposed onsite parking and circulation plans will be reviewed by the local Fire Department and Police Department to ensure that the Project's ingress/egress are adequate for accommodating emergency vehicles. Finally, a construction traffic plan will be required to be submitted to the Fire Department prior to development in order to provide adequate emergency access during construction of the proposed Project. Therefore, there is no potential for the development of the Project to physically interfere with any adopted emergency response plans, or evacuation plans. No impacts are anticipated and no mitigation is required.

g. *No Impact* – According to the Fire Hazard Areas map gathered from the Safety Element of the City's General Plan (Figure IX-8), the proposed Project site is not located in an area of concern for wildland fire hazards. Therefore, Project implementation would not result and a potential to expose people or structures to fire hazards. Potential Project-related impacts are less than significant; no mitigation measures are required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
X. HYDROLOGY AND WATER QUALITY: Would the project:				
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality?	☐	☒	☐	☐
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such the project may impede sustainable groundwater management of the basin?	☐	☐	☒	☐
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:				
(i) result in substantial erosion or siltation onsite or offsite?	☐	☐	☒	☐
(ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding onsite or offsite?	☐	☐	☒	☐
(iii) create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?; or,	☐	☒	☐	☐
(iv) impede or redirect flood flows?	☐	☐	☒	☐
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☐	☒	☐
e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☐	☐	☒	☐

SUBSTANTIATION: Much of the following information is abstracted from the following technical report: "*Water Quality Management Plan for Clean Energy E. Central Avenue & Tippecanoe Avenue San Bernardino, CA*" prepared by Site Design Collaborative dated September 28, 2021. This document is provided as Appendix 5 to this document.

a. *Less Than Significant With Mitigation Incorporated* – The proposed Project is located within the planning area of the Santa Ana Regional Water Quality Control Board (RWQCB). The Project site would be supplied with water by San Bernardino Municipal Water Department that uses local and imported water to meet customer demand.

For a developed area such as will occur at the project site, the only three sources of potential violation of water quality standards or waste discharge requirements are from generation of municipal wastewater, stormwater runoff, and potential discharges of pollutants, such as accidental spills. Because the project site will not host any permanent employees, Clean Energy does not propose to install restrooms or access to potable water. The site may host a portable toilet system, if required by the City. To address stormwater and accidental spills within this environment, any new project must ensure that site development implements a Storm Water Pollution Prevention Plan (SWPPP) and a National Pollutant Discharge Elimination System (NPDES) to control potential sources of water pollution that could violate any standards or discharge requirements during construction and a Water Quality Management Plan (WQMP) to ensure that Project-related after development surface runoff meets discharge requirements over the short- and long-term. The WQMP in Appendix 5 specifies stormwater runoff permit Best Management Practices (BMPs) requirements for capturing, retaining, and treating on site stormwater once the Project has been developed. Because much of the project site consists of impervious surfaces, the Project has identified an onsite drainage system that will generally be directed to the perforated infiltration trench, pervious pavement, and other water quality control measures such as bioretention basins onsite that will be developed as part of the Project. The SWPPP would specify the BMPs that the Project would be required to implement during construction activities to ensure that all potential water pollutants of concern are prevented from discharge, minimized, and/or otherwise appropriately treated prior to being discharged from the subject property. With implementation of these mandatory Plans and their BMPs, as well as mitigation measure **HAZ-1** above, the development of Project will not cause a violation of any water quality standards or waste discharge requirements.

b. *Less Than Significant Impact* –The Project does not propose the installation of any water wells that would directly extract groundwater and the change in pervious surfaces to impervious surfaces will be minimal because the site itself is not large at approximately 6.4-acres. The project site is located in the Bunker Hill Basin. According to the City General Plan, the San Bernardino Municipal Water Department (SBMWD) produces over 497 gallons per capita, per day with the average consumption reaching 330 gallons per capita per day. According to the City of San Bernardino General Plan, 9,198.9 acres are designated for commercial/industrial use within the City (commercial uses are listed for comparison purposes in the following discussion). The 2015 San Bernardino Valley Regional Urban Water Management Plan (UWMP) indicates that Commercial/Industrial uses demanded 6,083 acre-feet per year (AFY) of raw and potable water in 2015 in the SBMWD service area; a number which is anticipated to increase to 8,076 AFY by 2040. The proposed Project will encompass 6.4 acres, which represents 0.07% of the land designated for industrial use (6.4 acres ÷ 9.199 acres of land designated for industrial use = 0.07%). However, the Clean Energy is assuming minimal potable water will be utilized on the project site. Based on these assumptions, the Project would effectively be using no groundwater. Construction and landscaping will be supplied water from local recycled water when possible. Thus, the CNG Fueling Station is not forecast to cause any new demand for new groundwater supplies. The potential impact under this proposed Project is considered less than significant with no mitigation measures.

c. <u>i. Result in substantial erosion or siltation onsite or offsite?</u>

Less Than Significant Impact – The proposed Project is not anticipated to significantly change the volume of flows downstream of the project site, and would not be anticipated to change the amount of surface water in any water body in an amount that could initiate a new cycle of erosion or sedimentation downstream of the project site. The onsite drainage system will capture the incremental increase in runoff from the project site associated with Project development. Refer to Appendix 5. Impervious coverage of the site as proposed is anticipated to be about 80% (landscaped area will be about 20% of the site), and onsite surface flows will be collected and conveyed in a controlled manner through the project site to two proposed bioretention basins. This system will be designed to capture the peak runoff that exceeds the 100-year runoff from the project site or otherwise be detained on site and discharged in conformance with City and County requirements. The downstream drainage system will not be altered and given the control of future surface runoff from the project site, the potential for downstream erosion or sedimentation will be controlled to a less than significant impact level.

c. <u>ii. Substantially increase the rate or amount of surface runoff in a manner which would result in flooding onsite or offsite?</u>

Less Than Significant Impact – The proposed Project will alter the existing drainage onsite, but will maintain the existing offsite downstream drainage system through control of future discharges from the site, which would prevent flooding onsite or offsite from occurring. Refer to Appendix 5. Impervious coverage of the site as proposed is anticipated to be about 80% (landscaped area will be about 20% of the site), and onsite surface flows will be collected and conveyed in a controlled manner through the project site through bioretention basins and other water quality control measures. This system will be designed to capture the peak flows in excess of 100-year flow runoff from the project site or otherwise be detained on site and discharged in conformance with San Bernardino County requirements. Thus, the implementation of onsite drainage improvements and applicable requirements will ensure that stormwater runoff will not substantially increase the rate or volume of runoff in a manner that would result in flooding on- or off-site. Impacts under this issue are considered less than significant with no mitigation required.

c. <u>iii. Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?</u>

Less Than Significant With Mitigation Incorporated – As indicated above, the Project will not substantially create or contribute runoff water that would exceed the capacity of existing or planned stormwater capacity, or provide substantial additional sources of polluted water, particularly because the site plan includes bioretention basins, and other water quality control measures (such as landscape strips) that will collect on-site runoff. The Project will require the implementation of a SWPPP and WQMP, and implementation of mitigation measure **HAZ-1**, which will ensure that discharge of polluted material does not occur or is remediated in the event of an accidental spill. However, in most cases onsite surface flows will be collected and conveyed to the basins and other water quality control features. At present, the site is mostly pervious and runoff is either retained on site or is directed into adjacent public rights-of-way; thus, with the development of the site as proposed and through development of the planned drainage system management features, runoff from the site would be managed more efficiently than that which exists at present. Thus, the implementation of onsite drainage improvements and applicable requirements will ensure that that drainage and stormwater will not create or contribute runoff that would exceed the capacity of existing or planned offsite stormwater drainage systems or provide substantial additional sources of polluted runoff. Impacts under this issue are considered less than significant with implementation of mitigation.

c. <u>iv. Impede or redirect flood flows?</u>

Less Than Significant Impact – According to the City of San Bernardino General Plan 100-Year Floodplain Map (Figure X-1), the proposed Project is not located in a 100-year or 500-year flood hazard area. Furthermore, development of this site is not anticipated to redirect or impede flood flow at the project site, particularly given that surface flows on site will be directed to the onsite drainage features which will be capable of intercepting the peak flows above the 100-year flow rate from the project site or otherwise be detained on site and discharged in conformance with San Bernardino City requirements. Therefore, impacts under this issue are considered less than significant and no mitigation is required.

d. *Less Than Significant Impact* – Implementation of the Project will not expose people or structures to a significant risk of inundation by seiche, tsunami, or other flood hazards. According to the City of San Bernardino General Plan Seven Oaks Dam Inundation map (Figure X-2), the Project is within the limit of flooded area if the dam were to fail. The Seven Oaks Dam stores an average of about 10,000 acre-feet of water per year, and was designed to resist an earthquake measuring 8.0 on the Richter scale, with any point able to sustain a displacement of four feet without causing any overall structural damage (City GP pg. 10-10). An earthquake event of this magnitude is extremely unlikely. The Pacific Ocean is located more than 50 miles from the Pacific Ocean, which eliminates the potential for a tsunami to impact the Project area. Additionally, a seiche would not occur within the vicinity of the Project because no lakes or enclosed bodies of water exist near the site that could be impacted by such an event. It is anticipated that through compliance with the City's Municipal Code and implementation of the onsite drainage system, inundation hazards within the project site would be reduced to a level of less than significant. Therefore, the potential to expose people or structures to a significant risk of pollutants due to inundation would be minimal. No mitigation is required.

e. *Less Than Significant Impact* – "In 2014, Governor Brown signed into law the Sustainable Groundwater Management Act, also known as SGMA. The Act took effect in 2015. It requires for the first time in state history that groundwater resources be sustainably managed by local agencies through the formation of Groundwater Sustainability Agencies (GSAs) in each basin that are deemed high-priority or medium-priority by the Department of Water Resources. In such basins, GSAs are required to develop and implement Groundwater Sustainability Plans."[3] According to the California Department of Water Resources Groundwater Sustainability Agency Formation Notification System[4], the groundwater basin underlying the Project is not considered to be a basin that requires management under the Sustainable Groundwater Management Act. As such, the Project would not conflict with a sustainable groundwater management plan. Water consumption estimates indicate that the proposed Project's water demand is considered to be minimal. By controlling water quality during construction and operations through implementation of both short (SWPPP) and long (WQMP) term best management practices at the site, no potential for conflict or obstruction of the Regional Board's water quality control plan has been identified.

[3] https://www.wmwd.com/461/Sustainable-Groundwater-Management-Act
[4] https://sgma.water.ca.gov/webgis/index.jsp?appid=gasmaster&rz=true

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XI. LAND USE AND PLANNING: Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐

SUBSTANTIATION

a. *No Impact* – The project site is zoned for Light Industrial use and designated by the City's General Plan as Industrial use. The surrounding uses immediately adjacent to the project site are zoned and designated the same as the project site. The end of the San Bernardino International Airport runway is located just east of the site, and is therefore designated for Public Quasi Public use. The use adjacent to the project site is a gas station and convenience store, and as uses in all other directions are light industrial or Airport. Thus, the proposed project would conform to the surrounding uses. The addition of the CNG Fueling Station at this location would be consistent with both the uses surrounding the Project and the surrounding land use designations and zoning classifications. Consequently, the development of the project site with the proposed use will not divide any established community in any manner. Therefore, no impacts under this issue are anticipated and no mitigation is necessary.

b. *Less Than Significant Impact* – The project site is zoned for Light Industrial use and designated by the City's General Plan for Industrial use. The project site is also located within the Airport District One Overlay (AD-I) which allows service stations with ancillary commercial uses only at the intersections of major and secondary arterials such as the existing Tippecanoe Avenue and Central Avenue intersection. Further, the Applicant and the Airport have entered into an agreement to provide additional protection for stored CNG. Therefore, the implementation of this Project at this site will be consistent with surrounding land uses. Based on this information, implementation of the CNG Fueling Station would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the Project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect. Impacts under this issue are considered less than significant and no mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XII. MINERAL RESOURCES: Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

SUBSTANTIATION:

a&b. *No Impact* – The proposed CNG Fueling Station site is in an urbanized area surrounded by development within the City of San Bernardino. The site does not contain known mineral deposits, and according to the City's General Plan Mineral Resource Zones map (Figure XII-1), the project site is located within an area mostly designated as "MRZ-1: Areas where the available geologic information indicates no significant mineral deposits or a minimal likelihood of significant mineral deposits." Given the past use of the site as an olive grove, no mining operations are known to have occurred historically at or in the vicinity of the project site. Furthermore, a large portion of the City of San Bernardino is designated as MRZ-2, including the entirety of the San Bernardino International Airport, which is obviously not used for any mining activities. The City has not included this site within its Industrial Extractive classification, and as such, it is not planned to be used for mining activities by the City. Therefore, the development of the Project will not cause any loss of mineral resource values to the region or to residents of the state, nor would it result in the loss of any locally important mineral resources identified in the City of San Bernardino General Plan. No impacts would occur under this issue. No mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XIII. NOISE: Would the project result in:				
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of a project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☒	☐	☐
b) Generation of excessive groundborne vibration or groundborne noise levels?	☐	☒	☐	☐
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☒	☐

SUBSTANTIATION

Noise is generally described as unwanted sound. The proposed CNG Fueling Station Project will be developed within a 6.4-acre. There will be a covered (canopy) fast fill CNG dispenser area and time fill dispensers at the onsite delivery vehicle parking spaces. The site has one access on Tippecanoe Avenue and another on East Central Avenue (main entry).

The unit of sound pressure ratio to the faintest sound detectable to a person with normal hearing is called a decibel (dB). Sound or noise can vary in intensity by over one million times within the range of human hearing. A logarithmic loudness scale, similar to the Richter scale for earthquake magnitude, is therefore used to keep sound intensity numbers at a convenient and manageable level. The human ear is not equally sensitive to all sound frequencies within the entire spectrum. Noise levels at maximum human sensitivity from around 500 to 2,000 cycles per second are factored more heavily into sound descriptions in a process called “A-weighting,” written as “dBA.”

Leq is a time-averaged sound level; a single-number value that expresses the time-varying sound level for the specified period as though it were a constant sound level with the same total sound energy as the time-varying level. Its unit is the decibel (dB). The most common averaging period for Leq is hourly.

Because community receptors are more sensitive to unwanted noise intrusion during more sensitive evening and nighttime hours, state law requires that an artificial dBA increment be added to quiet time noise levels. The State of California has established guidelines for acceptable community noise levels that are based on the Community Noise Equivalent Level (CNEL) rating scale (a 24-hour integrated noise measurement scale). The guidelines rank noise land use compatibility in terms of "normally acceptable," "conditionally acceptable," and "clearly unacceptable" noise levels for various land use types. The State Guidelines, Land Use Compatibility for Community Noise Exposure, single-family homes are "normally acceptable" in exterior noise environments up to 60 dB CNEL and "conditionally acceptable" up to 70 dB CNEL based on this scale. Multiple family residential uses are "normally acceptable" up to 65 dB CNEL and "conditionally acceptable" up to 70 CNEL. Schools, libraries and churches are "normally acceptable" up to 70 dB CNEL, as are office buildings and business, commercial and professional uses with some structural noise attenuation.

The project site is located near the end of San Bernardino International Airport runway, Central Avenue, and Tippecanoe Avenue, and is, therefore, located in a relatively high background noise environment. As of 2019, the project site is outside of the Airport’s CNEL 65 noise contour (Figure XIII-1).[5] However, it is

[5] San Bernardino County, 2018; AEDT 2d; Adapted by ESA, 2018

anticipated that, based on the recent approval of the San Bernardino International Airport's Eastgate Building 1 Project, the noise contours will change significantly as Airport traffic increases related to the operation of the Eastgate Building 1 Project. As such, once constructed (by 2022), the project site will be located partially within the 65 CNEL noise contour (Figure XIII-2), and completely within the 65 CNEL noise contour and partially within the 70 CNEL noise contour by around 2024 (Figure XIII-3). As such, the noise environment at the project site is anticipated to increase by the time that the proposed Project is constructed and in operation.

a. *Less Than Significant With Mitigation Incorporated* – The proposed Project is located in a developed area and is adjacent to a major roadway which experiences heavy traffic due to the large number of logistics centers and warehouses located along Tippecanoe Avenue, a major north-south roadway, and Central Avenue, an important east-west roadway. Short-term noise levels associate with Project construction activities will not impact any sensitive receptors, as the noise generated from the Airport and from adjacent traffic would dominate the noise environment at the nearest sensitive receptor. Though the Project is located in an industrial corridor, there are a few non-conforming uses located across the street from the project site to the south, and as such, there are sensitive receptors nearby that could experience an increased noise level as a result of the proposed Project.

Short-Term Noise

The City's Noise Ordinance (Municipal Code Chapter 8.54, Noise Control) controls hours of operation for multiple sources of excessive noise. Excessive noise is not permitted between the hours of 8:00 PM and 8:00 AM in residential zones, and between 8:00 PM and 7:00 AM in all other zones. However, the City does not have a significance threshold for CEQA to assess noise impacts during construction, and construction noise is a short-term temporary event that occurs mostly during daytime hours (such as 8:00 AM to 5:00 PM). Construction noise is considered a common necessity for new development. Therefore, through compliance with the City's noise standards, short-term construction impacts would not expose persons to or generate noise in excess of standards established by the City or by any other applicable agencies. Therefore, short-term construction impacts would be considered less than significant. The Project will comply with the City Municipal Code, as construction will occur only within the hours considered allowable by the City. Construction equipment generates noise that ranges between approximately 75 and 90 dBA at a distance of 50 feet. Refer to Table XIII-1 below, which shows construction equipment noise levels at 25, 50 and 100 feet from the noise source. The nearest residence's property line to the project site is located about 100 feet from the Project's property line. The short-term noise impacts associated with Project construction activities are forecast to be less than significant through compliance with the City Municipal Code—as addressed above—and by implementing the following measures. As construction activities may be a nuisance to nearby residents, the following mitigation shall be implemented:

NOI-1 ***The City will require that all construction equipment be operated with mandated noise control equipment (mufflers or silencers). Enforcement will be accomplished by random field inspections by applicant personnel during construction activities.***

NOI-2 ***Equipment not in use for five minutes shall be shut off.***

NOI-3 ***Equipment shall be maintained and operated such that loads are secured from rattling or banging.***

NOI-4 ***Where available, electric-powered equipment shall be used rather than diesel equipment and hydraulic-powered equipment shall be used instead of pneumatic power.***

NOI-5 ***Construction employees shall be trained in the proper operation and use of equipment consistent with these mitigation measures, including no unnecessary revving of equipment.***

NOI-6 ***No radios or other sound equipment shall be used at this site unless required for emergency response by the contractor.***

NOI-7 ***Public notice shall be given prior to initiating construction. This notice shall be provided to all property owners/residents within 300 feet of the project site and shall be provided to property owners/residents at least one week prior to initiating construction. The notice shall identify the dates of construction and the name and phone number of a construction supervisor (contact person) in case of complaints. One contact person shall be assigned to the Project. The public notice shall encourage the adjacent residents to contact the construction supervisor in the case of a complaint. Resident's will be informed if there is a change in the construction schedule. The supervisor shall be available 24/7 throughout construction by mobile phone. If a complaint is received, the contact person shall take all feasible steps to remove the sound source causing the complaint. A log of complaints shall be maintained at the project site.***

Thus, based on the existing noise circumstances within the vicinity of the Project (i.e., from the Airport and from existing traffic along Tippecanoe and Central Avenues), short-term noise impacts are considered less than significant with the implementation of the mitigation measures above.

Long-Term Noise
The long term or permanent change in noise consists of the additional trips associated with full operation of the CNG Fueling Station. Due to the high background noise as a result of the proximity of the Airport and due to the large volume of traffic noise generated at Tippecanoe Avenue directly to the east of the project site, the additional trips generated (1,597 per day) to the site each day would not cause a significant change in the existing noise on the project site. Furthermore, there are between approximately 27,500 and 25,500 trips per day along Tippecanoe just east of the Project, and between approximately 8,600 and 17,700 trips per day along Central south of the Project, which indicates that the project site is located in a high existing background traffic noise environment. Once the Project is in operation, the Project will not require deliveries of material to the site. Truck access to the project site will be via both Central and Tippecanoe Avenues. The USTs for fuel on the western portion of the site, within about 150 feet of the nearest residences. Aside from trips to the site and from the site, primarily in the mornings and evening, the site should generate limited traffic.

However, with the background noise from the Airport, which, as previously stated, is anticipated to increase substantially between now and the time that the proposed Project will be in operation, and the short-term, single event nature of the aforementioned activities, operational noise is not expected to violate the City Municipal Code noise standards (such as standards 8.54.050[B] and [G]), but will cause minimal temporary increases in noise levels. The Project will be required to comply with the Noise Control standards outlined in the City Municipal Code which prohibits the timing of noisy events in the evening. Thus, with no long-term substantial increases in ambient noise levels, impacts under this issue are considered less than significant. No mitigation is required.

b. *Less Than Significant With Mitigation Incorporated* – Vibration is the periodic oscillation of a medium or object. The rumbling sound caused by vibration of room surfaces is called structure borne noises. Sources of groundborne vibrations include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) or human-made causes (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous or transient. Vibration is often described in units of velocity (inches per second), and discussed in decibel (dB) units in order to compress the range of numbers required to describe vibration. Vibration impacts related to human development are generally associated with activities such as train operations, construction, and heavy truck movements.

The FTA Assessment states that in contrast to airborne noise, ground-borne vibration is not a common environmental problem. Although the motion of the ground may be noticeable to people outside structures, without the effects associated with the shaking of a structure, the motion does not provoke the same adverse human reaction to people outside. Within structures, the effects of ground-borne vibration include noticeable movement of the building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. FTA Assessment further states that it is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads. However, some common sources of vibration are trains, trucks on rough roads, and construction activities, such as blasting, pile driving, and heavy earth-moving equipment. The Federal Transit Association (FTA) guidelines identify a level of 80 VdB for sensitive land uses. This threshold provides a basis for determining the relative significance of potential Project related vibration impacts.

In the short term, the excavation activities required to install the onsite distribution pipelines have a potential to create some vibration to the nearest sensitive receptors at some sites within the Project footprint. However, these impacts can be mitigated through implementing the following mitigation measure:

NOI-8 ***During future construction activities with heavy equipment within 300 feet of occupied residences, vibration field tests should be conducted at the nearest occupied residences. To the extent feasible, if vibrations exceed 72 VdB, the construction activities shall be revised to reduce vibration below this threshold.***

The proposed Project would be constructed with smooth pavement throughout the Project and would not result in significant groundborne noise or vibration impacts from average daily vehicular traffic. Thus, with the implementation of the above mitigation measure, any impacts under this issue are considered less than significant.

c. *Less Than Significant Impact* – There nearest public airport is the San Bernardino International Airport, the boundary for which is directly adjacent to the project site to the east. No private airports are located within the vicinity of the Project. According to the City of San Bernardino General Plan San Bernardino International Airport Planning Boundaries map—provided as Figure IX-7—the project site is located within the designated planning boundary. As stated in the preliminary discussion at the beginning of the Section, it is anticipated that, once the Eastgate Building 1 Project is constructed (in 2019, or by 2020), the project site will be located partially within the 65 CNEL noise contour (Figure XIII-2), and completely within the 65 CNEL noise contour and partially within the 70 CNEL noise contour by around 2024 (Figure XIII-3). The traffic noise along Tippecanoe Avenue is at a level similar to that which is generated by the Airport. The Project's industrial use is considered normally acceptable with exterior noise levels between 65 to 70 dBA. As such, since permanent employees will not occupy the site, though the Project is located within a high background noise environment from the nearby Airport and adjacent traffic noise, the noise levels at the project site would not exceed acceptable noise levels enforced by the City of San Bernardino; therefore, the Project would have a less than significant potential to expose people in the Project work area to excessive noise levels.

Table XIII-1
NOISE LEVELS OF CONSTRUCTION EQUIPMENT AT
25, 50 AND 100 FEET (in dBA LEQ) FROM THE SOURCE

Equipment	Noise Levels at 25 feet	Noise Levels at 50 feet	Noise Levels at 100 feet
Earthmoving			
Front Loader	85	79	73
Backhoes	86	80	74
Dozers	86	80	74
Tractors	86	80	74
Scrapers	91	85	79
Trucks	91	85	79
Material Handling			
Concrete Mixer	91	85	79
Concrete Pump	88	82	76
Crane	89	83	77
Derrick	94	88	82
Stationary Sources			
Pumps	82	79	70
Generator	84	78	72
Compressors	87	81	75
Other			
Saws	84	78	72
Vibrators	82	76	70

Source: U.S. Environmental Protection Agency "Noise"

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XIV. POPULATION AND HOUSING: Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

SUBSTANTIATION

a. *No Impact* – According to the SCAG's profile for the City of San Bernardino (May 2019), the City had a population of 221,130 in 2018.[6] The type of use planned for the project site is not of a type that would induce substantial population growth in the area. No housing is proposed as part of the Project. Relative to the total number residents of San Bernardino—approximately 221,130 persons—after construction there is unlikely to be any increase in the City's population. There would be no change in the work force within the City. The proposed Project is not anticipated to contribute to substantial growth in the area beyond that which has been planned by the City. Thus, based on the type of Project and no increment of potential indirect population growth. the Project implementation has no potential to induce substantial population growth that exceeds either local or regional projections.

b. *No Impact* – No occupied residences are located on the project site; therefore, implementation of the proposed Project will not displace substantial numbers of existing housing or persons, necessitating the construction of replacement housing elsewhere. No impacts will occur; therefore, no mitigation is required.

[6] https://www.scag.ca.gov/Documents/SanBernardino.pdf

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XV. PUBLIC SERVICES: Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
a) Fire protection?	☐	☐	☒	☐
b) Police protection?	☐	☐	☒	☐
c) Schools?	☐	☐	☒	☐
d) Parks?	☐	☐	☒	☐
e) Other public facilities?	☐	☐	☒	☐

SUBSTANTIATION

a. *Less Than Significant Impact* – The San Bernardino County Fire Department (SBCFD) provides fire protection services to the City. The nearest fire station is Station 221 at 200 E 3rd St, San Bernardino, CA 92410, which is approximately 1 mile northwest of the project site. According to the San Bernardino County Fire Annual Report July 2017-June 2018, SBCFD will increase availability of fire protection services in the City by ensuring quicker response times during times with high call volumes from nearby county fire stations.[7] The proposed Project would include the installation of fire hydrants to assist in combating potential fire hazards should they arise. As previously stated, due to the potential on-site use and storage of hazardous and flammable materials (CNG), the Project would also require an Emergency/Contingency Plan that would establish procedures to follow in the event of an emergency situation (such as a fire or hazardous release to the atmosphere). Oversight for this Plan is provided by the County of San Bernardino Fire Department, Hazardous Materials Division, and would be reviewed annually and renewed every three years. Implementation of necessary maintenance, training and emergency preparation provided by the Emergency/Contingency Plan, would ensure that the Proposed Project would have a less than significant impact on fire protection services. Therefore, impacts under this issue are considered less than significant. No mitigation is necessary.

b. *Less Than Significant Impact* – The proposed project site is in an urbanized area with substantial lighting and substantial traffic flow in the vicinity of the project site, due to the fact that Tippecanoe Avenue is well traveled. The San Bernardino Police Department would provide police protection services to the Project via their headquarters at 710 North “D” Street and standard patrol routes through the project area. Development of the site, which is mostly vacant and contains an abandoned olive grove, would introduce one new structure and customers to the project site. This would result in an incremental increase in demand for law enforcement services, but is not anticipated to require or result in the construction of new or physically altered law enforcement facilities. Prior to the issuance of building permits, the Applicant is required to comply with the provisions of the City of San Bernardino’s Development Impact Fee Ordinance (City Municipal Code, Chapter 3.27), which requires a fee payment that the City applies to the funding of public facilities, including law enforcement facilities, vehicles, and equipment. Additionally, the Project is not expected to result in any unique or more extensive crime problems that cannot be handled with the existing level of police resources. No new or expanded police facilities would need to be constructed as a result of the

[7] https://www.sbcfire.org/Portals/58/Documents/About/2017-18AnnualReport.pdf

Project. Therefore, impacts to police protection resources from implementation of the proposed Project are considered less than significant; no mitigation measures are required.

c. *Less Than Significant Impact* – The proposed Project is located within the area served by San Bernardino City Unified School District (SBCUSD). The nearest school is located about one mile north/northwest of the project site is H. Frank Dominguez Elementary School at 135 South Allen Street, San Bernardino, CA 92408. As addressed above under issue Population and Housing, XV(a) above, the proposed Project does not include any land uses that would substantially induce population growth, and will not require a substantial temporary or permanent labor force. Additionally, the payment of school fees is mandated and the State has determined that payment of these fees is deemed sufficient to offset any potential impacts from the Project. Thus, the proposed Project will not generate any increase in elementary, middle, or high school population. Therefore, any impacts under this issue are considered less than significant. No mitigation is required.

d. *Less Than Significant Impact* – As stated in the preceding sections, the proposed Project is not anticipated to create any increase in population through providing employment opportunities at the proposed project site. According to the City of San Bernardino General Plan, Chapter 8, Parks, Recreation, and Trails, "the City uses State Quimby Act and its Development Code for fees and land dedications as well as the Capital Improvement Program to establish standards and schedules for acquisition and development of new park or rehabilitation of existing parks and recreation facilities" (City GP pg. 8-3). The proposed Project will be required to pay all applicable Quimby Act and Development Code fees once the Project has been implemented. Therefore, with no potential to substantially increase the City's population, the Project's contribution to park and recreation facilities within the City would result in a less than significant impact under this issue. No mitigation is required.

e. *Less Than Significant Impact* – Other public facilities include library and general municipal services. Since the Project will not directly induce any population growth, it is not forecast that the use of such facilities will substantially increase as a result of the proposed Project. According to the City General Plan Public Facilities and Services section, the City requires new commercial and industrial development to contribute in-lieu fees for public art improvements. Therefore, the Project will be required to contribute these in-lieu fees and these fees are considered sufficient to offset any impacts to other public facilities as a result of implementing the Project. Thus, any impacts under this issue are considered less than significant, and no mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XVI. RECREATION:				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

SUBSTANTIATION

a. *No Impact* – As addressed in the discussion under XIV and XV(d) above, the proposed Project does not include a use that would substantially induce population growth, and will not require a substantial short- or long-term labor force for either construction or operations of the proposed Project. Thus, the proposed Project will not generate a substantial increase in residents of the City who would increase the use of existing recreational facilities. Additionally, the proposed Project will be developed on land that is designated by the City's General Plan for Industrial use, and is not listed in any planning documents as desirable land for future park development. Therefore, the proposed Project would have a less than significant potential to physically deteriorate park or recreational facilities through increased use. No mitigation is required.

b. *No Impact* – The proposed Project consists of a CNG Fueling Station. The Project will not include any recreational facilities, nor will it require the construction of new recreational facilities or expansion of new recreational facilities because the proposed Project is not anticipated to induce any population growth. The use of the site as for the intended purpose is not forecast to require a substantial short- or long-term labor force. As a result, no recreational facilities—existing or new—are required to serve the Project; thus, no impacts are anticipated under this issue. No mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XVII. TRANSPORTATION: Would the project:				
a) Conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?	☐	☐	☒	☐
b) Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?	☐	☐	☒	☐
c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☒	☐
d) Result in inadequate emergency access?	☐	☐	☒	☐

SUBSTANTIATION: The following section is based on the Traffic Impact Analysis (TIA) prepared by Linscott Law & Greenspan Engineers and titled "*Traffic Impact Analysis Report CNG Fueling Station Project San Bernardino, California*" dated September 29, 2021. The TIA is provided as Appendix 6.

Background: Executive Summary

The following analysis of the projects trip generation is drawn from the Executive Summary of the TIA. Please refer to Appendix 6 for the detailed information supporting the summary provided below.

Project Description

The proposed project is generally located on the northwest corner pf Tippecanoe Avenue at Central Avenue in the City of San Bernardino, California. The project site is currently vacant and the project envisions two phases of development. Phase I will consist of two (2) fast-fill CNG dispensers, the support systems and equipment, the canopy and 153 time fill posts for trucks and 151 parking spaces for passenger vehicles. Phase 2 will consist of two additional fast-fill CNG dispensers, 62 additional time fill posts for trucks and 89 additional regular parking spaces. As part of Phase 2, 25 passenger vehicle spaces that are part pf Phase 1 will be converted to 18 time fill posts for trucks. Final development will consist of four fast-fill CNG dispensers, 215 time fill posts for trucks and 215 parking spaces for passenger vehicles. The project is anticipated to be completed by the Year 2023. Access to the project will be provided via one (1) right-turn put only unsignalized driveway located along Tippecanoe Avenue (Project Driveway No. 1), one (1) full-egress only unsignalized driveway located along Central Avenue (Project Driveway No.2) and one (1) full-ingress only unsignalized driveway located along Central Avenue (Project Driveway No. 3).

The proposed project, inclusive of both the fast fill dispensers and time fill posts, is forecast to generate 1,597 passenger car equivalent (PCE) daily trips, with 139 PCE trips (59 inbound and 80 outbound) produced during the A< peak hour and 178 PCE trips (103 inbound, 75 outbound) produced in the PM peak hour on a "typical" weekday.

Study Area
Five key intersections were selected for evaluation based on discussions with City of San Bernardino Public Works Department staff. The intersections listed below provide local access to the study area and define the extent of the boundaries for this traffic impact investigation. The jurisdiction where each key study intersection is located is also identified.

1. Tippecanoe Avenue at Mill Street (San Bernardino)
2. Tippecanoe Avenue at Central Avenue (San Bernardino)
3. Tippecanoe Avenue at Orange Show Road (San Bernardino)
4. Tippecanoe Avenue at Harriman Place/I-10 West Bound Ramps (San Bernardino/Caltrans)

5. Tippecanoe Avenue/Anderson Street at I-10 East Bound Ramps (Loma Linda/Caltrans)

Cumulative Projects Description
A total of twenty-one cumulative projects are forecast to generate 42,028 daily trips (one half arriving, one half departing), with 4,259 trips (2,406 inbound and 1,853 outbound) forecast during the AM peak hour and 3,200 trips (1,441 inbound and 1,759 outbound) forecast during the PM peak hour on a "typical" weekday.

Traffic Impact Analysis

Existing Traffic Conditions
For existing traffic conditions, all five key study intersections currently operate at acceptable Level of Service (LOS) C or better during the AM and PM peak hours when compared to the LOS thresholds defined in Appendix 6.

Existing with Project Traffic Conditions
The proposed project will not significantly impact the five key study intersections when compared to the LOS standards and significant impact criteria specified in Appendix 6. The five key study intersections currently operate and are forecast to continue to operate at an acceptable LOS during the AM and PM peak hours with the addition of project generated traffic to existing traffic.

Year 2023 With Project Traffic Conditions
The proposed project will not significantly impact the five key study intersections when compared to the LOS standards and significant impact criteria specified in this report. The five key study intersections are forecast to continue to operate at an acceptable LOS D or better during the AM and PM peak hours with the addition of project generated traffic in the horizon year, Year 2023.

Site Access and Internal Circulation Evaluation

The three project driveways are forecast to operate at acceptable LOS C or better during the AM and PM peak hours for the Year 2023 with Project traffic conditions. As such, project access will be adequate. Motorists entering and existing the project site will be able to do so comfortably, safely, and without congestion.

Th on-site circulation layout of the proposed project on an overall basis is adequate. Curb return radii have been confirmed and are general adequate for small service/deliver (FedEx, UPS) trucks and large trucks (tractors).

Caltrans Facilities Analysis

The two state-controlled study intersections are forecast to operate at an acceptable LOS D or better during the AM peak hour and PM peak hour without and with the proposed project for all analyzed traffic conditions.

Recommended Improvements

Existing With Project Traffic Conditions
The results of the Existing With Project traffic conditions LOS analyses indicate that the proposed project will not significantly impact any of the five key study intersections. All five key study intersections are forecast to operate at acceptable LOS under Existing With Project conditions. Thus, no improvement measures are recommended.

Year 2023 With Project Traffic Conditions
The results of the Year 2023 With Project traffic conditions LOS analyses indicate that the proposed project will not significantly impact any of the five key study intersections. All five key study intersections are forecast to operate at acceptable LOS under Year 2023 With Project conditions. Thus, no improvement measures are recommended.

<u>*Impact Findings*</u>

a. *Less Than Significant Impact* – Based on the detailed traffic analysis in Appendix 6, the proposed project will not conflict with any program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities. The proposed project will install sidewalks to support pedestrian traffic. The proposed project shifts fuel consumption to CNG that has a negative GHG footprint, and therefore, supports State goals to minimize GHG emissions related to transportation. A less than significant impact is forecast under this issue.

b. *Less Than Significant Impact* – The TIA includes an evaluation of VMT for the proposed project. For the VMT screening analysis, Project Screening – Step 3: project type screening was applied to the proposed project. Project Screening – Step 3: Project Type Screening states that for local serving retail uses (including gas stations) less than 50,000 square feet (sf), a less than significant determination can be presumed. Local serving retail (including gas stations) generally improves the convenience of shopping close to home and has the effect of reducing vehicular travel. The proposed project will consist of CNG time fill posts for 215 trucks and parking for 215 passenger vehicles, as well as four fast frill CNG dispenser fueling positions. Therefore, based on the aforementioned criteria, this project can be screened from the VMT analysis, and can be presumed to have a less than significant impact on VMT in accordance with the City's guidelines. Refer to Appendix 6 for a more detailed discussion of this issue.

c. *Less Than Significant Impact* – The proposed Project is located along Central Avenue and Tippecanoe Avenue. Roadway improvements necessary to provide site access and on-site circulation are assumed to be constructed in conjunction with site development and are described below. These improvements are required to be in place prior to occupancy. Figure XVII-1 illustrates the site-adjacent roadway improvement recommendations and the on-site and site adjacent recommended roadway lane improvements for each of the applicable Project driveways. The recommended site-adjacent roadway improvements for the Project are not considered substantial and will not result in a significant increase in roadway hazards adjacent to the project site during installation. No mitigation is required.

d. *Less Than Significant Impact* – Please refer to the discussion of site access provided under issue XVII(c) above, and refer to Figure XVII-1, which depicts site adjacent roadway and site access improvements. Site access will be provided along Tippecanoe Avenue and Central Avenue. The proposed Project will involve a small amount of construction within adjacent roadways to the project site. Access to the site must comply with the design referenced above, and additionally, access to the site must comply with all City design standards, and would be reviewed by the City to ensure that inadequate design features or incompatible uses do not occur. Additionally, the proposed Project would be required to comply with all applicable fire code and ordinance requirements for construction and access to the site. Emergency response and evacuation procedures would be coordinated with the City, as well as the police and fire departments, during construction. Thus, because of the minimal adverse impact on local circulation there is a less than significant potential to impact emergency access during construction or operation. No mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XVIII. TRIBAL CULTURAL RESOURCES: Would the project cause a substantial change in the significance of tribal cultural resources, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to the California Native American tribe, and that is:				
a) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☒	☐	☐
b) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in sub-division (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☒	☐	☐

SUBSTANTIATION: Note: Conducting consultation early in the CEQA process allows tribal governments, lead agencies, and project proponents to discuss the level of environmental review, identify and address potential adverse impacts to tribal cultural resources, and reduce the potential for delay and conflict in the environmental review process. (See Public Resources Code section 21083.3.2.) Information may also be available from the California Native American Heritage Commission's Sacred Lands File per Public Resources Code section 5097.96 and the California Historical Resources Information System administered by the California Office of Historic Preservation. Public Resources Code section 21082.3(c) contains provisions specific to confidentiality.

A Tribal Resource is defined in the Public Resources Code section 21074 and includes the following:

- Sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American Tribe that are either of the following: included or determined to be eligible for inclusion in the California Register of Historical Resources or included in a local register of historical resources as defined in subdivision (k) of Section 5020.1;
- A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Section 5024.1. In applying the criteria set forth in subdivision (c) of Section 5024.1 for the purpose of this paragraph, the lead agency shall consider the significance of the resources to a California American tribe;
- A cultural landscape that meets the criteria of subdivision (a) is a tribal cultural resource to the extent that the landscape is geographically defined in terms of the size and scope of the landscape;
- A historical resource described in Section 21084.1, a unique archaeological resource as defined in subdivision (g) of Section 21083.2, or a "non-unique archaeological resource" as defined in subdivision (h) of Section 21083.2 may also be a tribal resource if it conforms with the criteria of subdivision (a).

a&b. *Less Than Significant With Mitigation Incorporated* – The project site is located within the area of cultural significance for the Gabrieleño Band of Mission Indians – Kizh Nation, San Manuel Band of Mission Indians, and the Soboba Band of Luiseño Indians. As stated in the Project Description, the City sent letters to the Gabrieleño Band of Mission Indians – Kizh Nation, San Manuel Band of Mission Indians, and the Soboba Band of Luiseño Indians pursuant to AB-52. The City received a response from the San Manuel Band of Mission Indians requesting the following mitigation measures in addition to mitigation measures **CUL-2** through **CUL-4** identified under Section VI, Cultural Resources above:

TCR-1 ***The San Manuel Band of Mission Indians Cultural Resources Department (SMBMI) shall be contacted, as detailed in CR-1, of any pre-contact cultural resources discovered during project implementation, and be provided information regarding the nature of the find, so as to provide Tribal input with regards to significance and treatment. Should the find be deemed significant, as defined by CEQA (as amended, 2015), a Cultural Resources Monitoring and Treatment Plan shall be created by the archaeologist, in coordination with SMBMI, and all subsequent finds shall be subject to this Plan. This Plan shall allow for a monitor to be present that represents SMBMI for the remainder of the project, should SMBMI elect to place a monitor on-site.***

TCR-2 ***Any and all archaeological/cultural documents created as a part of the project (isolate records, site records, survey reports, testing reports, etc.) shall be supplied to the applicant and Lead Agency for dissemination to SMBMI. The Lead Agency and/or applicant shall, in good faith, consult with SMBMI throughout the life of the project.***

Additionally, the City received a response from the Gabrieleño Band of Mission Indians – Kizh Nation, in which they requested to meet on the Project, which resulted in the Kizh Nation deferring to the San Manuel Band of Mission Indians based on the location of the project. AB 52 concluded on January 9th with no further responses from any of the three tribes. As such, with implementation of mitigation measures **CUL-1** through **CUL-4**, and the mitigation measures identified above, the project is not anticipated to cause a change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape, or object with cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American Tribe. No further mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XIX. UTILITIES AND SERVICE SYSTEMS: Would the project:				
a) Require or result in the relocation or construction of new or expanded water, wastewater treatment, or stormwater drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	☐	☐	☒	☐
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?	☐	☐	☒	☐
c) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	☐	☐	☒	☐
e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	☐	☐	☒	☐

SUBSTANTIATION

a. <u>Water</u>

Less Than Significant Impact – Water will be provided by the San Bernardino Municipal Water Department (SBMWD or Department). The Project is located in an area that is currently served by water transmission lines, and as such, the proposed Project will be served by an existing water transmission lines located within the roadways adjacent to the project site. It is not anticipated that the relocation or construction of new or expanded water transmission pipelines would be required to serve the proposed Project. The Project would be supplied with water by SBMWD that mostly uses groundwater from the Bunker Hill Basin to meet customer demand. As previously stated under issue X, Hydrology and Water Quality, the Department's Urban Water Management Plan (UWMP, 2015) identifies sufficient water resources to meet demand in its service area. The Project will operate under the guidelines outlined in the Regional UWMP and within SBMWD's capacity, and the estimated water demand will represent only a nominal percentage of the surplus that currently exists in the water supply system. The anticipated water supply within SBMWD's retail service area is anticipated to be greater than the demand for water in the future, which indicates that the Department has available capacity to serve the proposed Project. Therefore, development of the San Bernardino CNG Fueling Station Project would not result in a significant environmental effect related to the relocation or construction of new or expanded water facilities. Impacts are less than significant.

<u>Wastewater</u>

*No Impact – W*astewater collection is provided by San Bernardino Municipal Water Department's (SBMWD) Water Reclamation Plant (WRP). The proposed Project does not intend to install restrooms at the project site at this time. Therefore, the proposed project will not consume any wastewater collection or treatment capacity. Thus, there would be no anticipated relocation or construction of new or expanded wastewater transmission facilities.

Stormwater
Less Than Significant Impact – The stormwater runoff, will be managed in accordance with the WQMP as discussed in the Hydrology and Water Quality Section (Section X) of this Initial Study. The onsite drainage system will capture the incremental increase in runoff from the project site associated with Project development. Impervious coverage of the site as proposed is anticipated to be about 80% (landscaped area will be about 20% of the site), and onsite surface flows will be collected and conveyed in a controlled manner to the adjacent drainage system. This system will be designed to capture the peak 100-year flow runoff from the project site or otherwise be detained on site and discharged in conformance with City and San Bernardino County requirements. Therefore, surface water will be adequately managed on site and as such, development of the Project would not result in a significant environmental effect related to the relocation or construction of new or expanded stormwater facilities. Impacts are less than significant.

Electric Power
Less Than Significant Impact – Southern California Edison (SCE) will provide electricity to the site and the power distribution system located adjacent to the site will be able to supply sufficient electricity. There are existing electrical power lines that traverse the property, to which the Project will be connected. No construction or relocation of electric facilities will be required to serve the Project. Therefore, development of the Project would not result in a significant environmental effect related to the relocation or construction of new or expanded electric power facilities. Impacts are less than significant.

Natural Gas
Less Than Significant Impact – Natural gas will be supplied by Southern California Gas (SCG). The applicant will acquire credits for biogas to offset consumption of natural gas provided by SCG. The site will connect to the existing natural gas line that traverses adjacent to the property, in which the Project will be connected to serve both the fast fill and time fill CNG systems. No construction or relocation of natural gas facilities will be required to serve the Project, other than extension of natural gas lines onto the property. Therefore, development of the Project would not result in a significant environmental effect related to the relocation or construction of new or expanded natural gas facilities. Impacts are less than significant.

Telecommunications
Less Than Significant Impact – Development of the CNG Fueling Station Project may require connection to telecommunication services, including wireless internet service and phone service. This can be accomplished through connection to existing services that are available to the developer at the project site. Therefore, development of the Project would not result in a significant environmental effect related to the relocation or construction of new or expanded telecommunications facilities. Impacts are less than significant.

b. *Less Than Significant Impact* - Please refer to the discussion under Hydrology, Section X(b) above. The available future water supply within SBMWD's retail service area is anticipated to be greater than the demand for water in the future, which indicates that the SBMWD has available capacity to serve the proposed Project. As such, given that the 2015 San Bernardino Valley Regional Urban Water Management Plan (UWMP)[8] indicates that the Water Department anticipates ample water supply will be available to serve the Project's minimal daily demand, it is anticipated that the Project will have sufficient water supplies available to serve the Project and reasonably foreseeable future development during normal, dry and multiple dry years. Impacts under this issue are considered less than significant.

c. *No Impact* – The project does not propose to install wastewater infrastructure within the site to serve the project site. Thus, the proposed project can have no adverse impact on this infrastructure system.

d&e. *Less Than Significant Impact* – The proposed Project will generate a very limited demand for solid waste service system capacity and has no potential to contribute to potentially significant cumulative

[8] http://www.sbcity.org/civicax/filebank/blobdload.aspx?BlobID=20386

demand impacts on the solid waste system. It is assumed that one five-yard trash bin may be filled each week. This equates to about 260 yards of solid waste per year. Assuming 1.3 tons of waste per cubic yard of trash, this represents a total of about 169 tons of trash, assuming a 50% diversion of the waste under AB 939. With the City's mandatory source reduction and recycling program, the proposed Project is not forecast to cause a significant adverse impact to the waste disposal system.

The City of San Bernardino General Plan identifies landfills that serve the planning area. The San Timoteo Sanitary Landfill and Mid-Valley Sanitary Landfill serve the Project area. The San Timoteo Sanitary Landfill has a maximum permitted daily capacity of 2,000 tons per day, with a permitted capacity of 20,400,000 cubic yards (CY), with 11,402,000 CY of capacity remaining. The Mid-Valley Sanitary Landfill has a maximum permitted daily capacity of 7,500 tons per day, with a permitted capacity of 101,300,000 CY, with 67,520,000 CY of capacity remaining. According to Jurisdiction Landfill Tonnage Reports from the City of San Bernardino, 183,077 total tons of solid waste was hauled to area landfills in 2017.[9] Therefore, the proposed Project would consist of about 0.049% of solid waste generation within the City of San Bernardino. The City of San Bernardino contracts with Burrtec Waste and Recycling Services to provide regular trash, recycling, and green waste pickup. It is not anticipated that the Project will generate a significant amount of construction waste, as the Project aims to use any excavated material on site, with import of 5,000 cubic yards of material to support site cut and fill. Therefore, the Project is expected to comply with all regulations related to solid waste under federal, state, and local statutes, and be served by a landfill(s) with sufficient permitted capacity to accommodate the Project's solid waste disposal needs. No further mitigation is necessary.

[9] https://www2.calrecycle.ca.gov/LGCentral/AnnualReporting/ReviewReports/DisposalTonnageTrend

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XX. WILDFIRE: If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:				
a) Substantially impair an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of wildfire?	☐	☐	☐	☒
c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	☐	☐	☐	☒
d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	☐	☐	☐	☒

SUBSTANTIATION

a-d. *No Impact* – The proposed project is not located in or near state responsibility areas or lands classified as very high fire hazard severity zone, therefore the proposed project can contribute no adverse impacts to any wildfire issues. As stated in previous sections, according to the City of San Bernardino Hazard Map for the Project area, the proposed Project is not located within the fire safety severity zone (Figure IX-8) of the General Plan. Furthermore, according to CAL FIRE, the proposed Project is not located within a Very High Fire Hazard Severity Zone in a Local Responsibility Area (LRA) or in a State Responsibility Area (SRA), which is illustrated on Figures XX-1 and XX-2. The proposed Project area is located in an urban area removed from the high fire hazard areas that are located adjacent to the San Bernardino Mountains to the north. As such, no impacts under these issues are anticipated.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XXI. MANDATORY FINDINGS OF SIGNIFICANCE:				
a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☒	☐	☐
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☒	☐	☐

SUBSTANTIATION

The analysis in this Initial Study and the findings reached indicate that the proposed project can be implemented without causing any new project specific or cumulatively considerable unavoidable significant adverse environmental impacts. Mitigation is required to control some potential environmental impacts of the proposed project to a less than significant impact level. The following findings are based on the detailed analysis of the Initial Study of all environmental topics and the implementation of the mitigation measures identified in the previous text and summarized following this section.

a. *Less Than Significant With Mitigation Incorporated* – The project has no potential to cause a significant impact any biological or cultural resources. The project has been identified as having no potential to degrade the quality of the natural environment, substantially reduce habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or reduce the number or restrict the range of a rare or endangered plant or animal. The project requires mitigation to prevent significant impacts from occurring as a result of its implementation. Based on the historic disturbance of the site, and its current condition, the potential for impacting cultural resources is low. The Cultural Resources Report determined that no cultural resources of importance were found at the project site, so it is not anticipated that any resources could be affected by the project because no cultural resources exist. However, because it is not known what could be unearthed upon any excavation activities, contingency mitigation measures are provided to ensure that, in the unlikely event that any buried resources are accidentally exposed, they are protected from any potential impacts. Please see biological and cultural sections of this Initial Study.

b. *Less Than Significant With Mitigation Incorporated* – The project has 14 potential impact categories that are individually limited, but may be cumulatively considerable. These are: Aesthetics, Air Quality, Biological Resources, Cultural Resources, Energy, Geology & Soils, Hazards & Hazardous Materials, Hydrology & Water Quality, Noise, Public Services, Transportation, Tribal Cultural Resources, Utilities & Service Systems, and wildfire. The project is not considered growth-inducing, as defined by *State CEQA Guidelines* (http://ceres.ca.gov/ceqa/guidelines/). Most of these issues require the implementation of mitigation measures to reduce impacts to a less than significant level and ensure that cumulative effects are not cumulatively considerable. All other environmental issues were found to have no significant impacts without implementation of mitigation. The potential cumulative environmental effects of implementing the proposed project have been determined to be less than considerable and thus, less than significant impacts.

c. *Less Than Significant With Mitigation Incorporated* – The proposed project includes activities that have a potential to cause direct substantial adverse effects on humans. The issues of Air Quality, Geology and Soils, Hazards & Hazardous Materials, Hydrology and Water Quality, Noise require the implementation of mitigation measures to reduce potential direct human impacts to a less than significant level. All other environmental issues were found to have no significant impacts on humans without implementation of mitigation. The potential for direct human effects from implementing the proposed project have been determined to be less than significant.

Conclusion

This document evaluated all CEQA issues contained in the latest Initial Study Environmental Checklist Form. The evaluation determined that either no impact or less than significant impacts would be associated with the issues of Agriculture and Forestry Resources, Energy, Greenhouse Gases, Land Use and Planning, Mineral Resources, Population and Housing, Public Services, Recreation, and Wildfire. The issues of Aesthetics, Air Quality, Biological Resources, Cultural Resources, Geology & Soils, Hazards & Hazardous Materials, Hydrology & Water Quality, Noise, Transportation, Tribal Cultural Resources, Utilities & Service Systems, require the implementation of mitigation measures to reduce project-specific and cumulative impacts to a less than significant level. The required mitigation has been proposed in this Initial Study and will be implemented to reduce impacts for these issues to a less than significant impact level.

Based on the evidence and findings in this Initial Study, the City of San Bernardino proposes to adopt a Mitigated Negative Declaration for the San Bernardino CNG Fueling Station Project. A Notice of Intent to Adopt a Mitigation Negative Declaration (NOI) will be issued for this Project by the City. The Initial Study and NOI will be circulated for 30 days of public comment. At the end of the 30-day review period, a final MND package will be prepared and it will be reviewed by the City for possible adoption at a future meeting, the date for which has yet to be determined. If you or your agency comments on the MND/NOI for this Project, you will be notified about the meeting date in accordance with the requirements in Section 21092.5 of CEQA (statute).

Note: Authority cited: Sections 21083 and 21083.05, Public Resources Code. Reference: Section 65088.4, Gov. Code; Sections 21080(c), 21080.1, 21080.3, 21083, 21083.05, 21083.3, 21093, 21094, 21095, and 21151, Public Resources Code; *Sundstrom v. County of Mendocino*,(1988) 202 Cal.App.3d 296; *Leonoff v. Monterey Board of Supervisors*, (1990) 222 Cal.App.3d 1337; *Eureka Citizens for Responsible Govt. v. City of Eureka* (2007) 147 Cal.App.4th 357; *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th at 1109; San *Franciscans Upholding the Downtown Plan v. City and County of San Francisco* (2002) 102 Cal.App.4th 656.

Revised 2019
Authority: Public Resources Code sections 21083 and 21083.09
Reference: Public Resources Code sections 21073, 21074, 21080.3.1, 21080.3.2, 21082.3/ 21084.2 and 21084.3

SUMMARY OF MITIGATION MEASURES

Aesthetics

AES-1 The Applicant shall obtain a tree removal permit from the San Bernardino Community Development Department should development of the project site require the removal of 5 or more trees. Construction shall not commence until this permit is obtained from the City and the tree permit conditions implemented by the site developer.

Air Quality

AIR-1 Fugitive Dust Control. The following measures shall be incorporated into Project plans and specifications for implementation:

- Apply soil stabilizers or moisten inactive areas.
- Water exposed surfaces as needed to avoid visible dust leaving the construction site (typically 2-3 times/day).
- Cover all stock piles with tarps at the end of each day or as needed.
- Provide water spray during loading and unloading of earthen materials.
- Minimize in-out traffic from construction zone.
- Cover all trucks hauling dirt, sand, or loose material and require all trucks to maintain at least two feet of freeboard.
- Sweep streets daily if visible soil material is carried out from the construction site.

AIR-2 Exhaust Emissions Control. The following measures shall be incorporated into Project plans and specifications for implementation:

- Utilize well-tuned off-road construction equipment.
- Establish a preference for contractors using Tier 3 or better heavy equipment.
- Enforce 5-minute idling limits for both on-road trucks and off-road equipment.

Biological Resources

BIO-1 Burrowing Owl. Preconstruction presence/absence surveys for burrowing owl shall be conducted within 30 days prior to any onsite ground disturbing activity. The burrowing owl survey shall be conducted pursuant to the recommendations and guidelines established by the California Department of Fish and Wildlife. In the event this species is not identified within the Project limits, no further mitigation is required. If during the preconstruction survey, the burrowing owl if found to occupy the site, Mitigation Measure BIO-2 shall be required.

BIO-2 If burrowing owls are identified during the survey period, the City shall require the Project applicant to take the following actions to offset impacts prior to ground disturbance:

Active nests within the areas scheduled for disturbance or degradation shall be avoided from February 1 through August 31, and a minimum of 250-foot buffer shall be provided until fledging has occurred. Following fledging, owls may be passively relocated by a qualified biologist.

If impacts on occupied burrows in the non-nesting period are unavoidable, onsite passive relocation techniques may be used if approved by the CDFW to encourage owls to move to alternative burrows outside of the impact area.

If relocation of the owls is approved for the site by the CDFW, the City shall require the developer to hire a qualified biologist to prepare a plan for relocating the owls to a suitable site. The relocation plan must include all of the following:

- The location of the nest and owls proposed for relocation.
- The location of the proposed relocation site.
- The number of owls involved and the time of year when the relocation is proposed to take place.
- The name and credentials of the biologist who will be retained to supervise the relocation.
- The proposed method of capture and transport for the owls to the new site.
- A description of site preparation at the relocation site (e.g., enhancement of existing burrows, creation of artificial burrows, one-time or long-term vegetation control).

BIO-3 The State of California prohibits the “take” of active bird nests. To avoid an illegal take of active bird nests, any grubbing, brushing or tree removal should be conducted outside of the the State identified nesting season (Raptor nesting season is February 15 through July 31; and migratory bird nesting season is March 15 through September 1). Alternatively, the site shall be evaluated by a qualified biologist prior to the initiation of ground disturbace to determine the presence or absence of nesting birds. Active bird nests MUST be avoided during the nesting season. If an active nest is located in the Project construction area it will be flagged and a 300-foot avoidance buffer placed around it. No activity shall occur within the 300-foot buffer until the young have fledged the nest.

<u>Cultural Resources</u>

CUL-1 Should any cultural resources be encountered during construction of these facilities, earthmoving or grading activities in the immediate area of the finds shall be halted and an onsite inspection shall be performed immediately by a qualified archaeologist. Responsibility for making this determination shall be with the City’s onsite inspector. The archaeological professional shall assess the find, determine its significance, and make recommendations for appropriate mitigation measures within the guidelines of the California Environmental Quality Act.

CUL-2 In the event that cultural resources are discovered during project activities, all work in the immediate vicinity of the find (within a 60-foot buffer) shall cease and a qualified archaeologist meeting Secretary of Interior standards shall be hired to assess the find. Work on the other portions of the project outside of the buffered area may continue during this assessment period. Additionally, the San Manuel Band of Mission Indians Cultural Resources Department (SMBMI) shall be contacted, as detailed within TCR-1, regarding any pre-contact finds and be provided information after the archaeologist makes his/her initial assessment of the nature of the find, so as to provide Tribal input with regards to significance and treatment.

CUL-3 If significant pre-contact cultural resources, as defined by CEQA (as amended, 2015), are discovered and avoidance cannot be ensured, the archaeologist shall develop a Monitoring and Treatment Plan, the drafts of which shall be provided to SMBMI for review and comment, as detailed within TCR-1. The archaeologist shall monitor the remainder of the project and implement the Plan accordingly.

CUL-4 If human remains or funerary objects are encountered during any activities associated with the project, work in the immediate vicinity (within a 100-foot buffer of the find) shall cease and the County Coroner shall be contacted pursuant to State Health and Safety Code §7050.5 and that code enforced for the duration of the project.

<u>Geology and Soils</u>

GEO-1 Prior to initiating grading, the site developer shall provide a geotechnical evaluation of the potential liquefaction hazards at the site and, if a hazard exists at the proposed Project location, the evaluation shall define design measures that will ensure the safety of any new structures in protecting human life in the event of a regional earthquake affecting the site. The developer shall implement any design measures required for onsite structures to protect human safety.

GEO-2 Stored backfill material shall be covered with water resistant material during periods of heavy precipitation to reduce the potential for rainfall erosion of stored backfill material. If covering is not feasible, then measures such as the use of straw bales or sand bags shall be used to capture and hold eroded material on the Project site for future cleanup.

GEO-3 All exposed, disturbed soil (trenches, stored backfill, etc.) shall be sprayed with water or soil binders twice a day, or more frequently if fugitive dust is observed migrating from the site within which the Project is being constructed.

Hazards and Hazardous Materials

HAZ-1 All spills or leakage of petroleum products during construction activities will be remediated in compliance with applicable state and local regulations regarding cleanup and disposal of the contaminant released. The contaminated waste will be collected and disposed of at an appropriately licensed disposal or treatment facility. This measure will be incorporated into the SWPPP prepared for the Project development and implemented during construction.

Noise

NOI-1 The City will require that all construction equipment be operated with mandated noise control equipment (mufflers or silencers). Enforcement will be accomplished by random field inspections by applicant personnel during construction activities.

NOI-2 Equipment not in use for five minutes shall be shut off.

NOI-3 Equipment shall be maintained and operated such that loads are secured from rattling or banging.

NOI-4 Where available, electric-powered equipment shall be used rather than diesel equipment and hydraulic-powered equipment shall be used instead of pneumatic power.

NOI-5 Construction employees shall be trained in the proper operation and use of equipment consistent with these mitigation measures, including no unnecessary revving of equipment.

NOI-6 No radios or other sound equipment shall be used at this site unless required for emergency response by the contractor.

NOI-7 Public notice shall be given prior to initiating construction. This notice shall be provided to all property owners/residents within 300 feet of the project site and shall be provided to property owners/residents at least one week prior to initiating construction. The notice shall identify the dates of construction and the name and phone number of a construction supervisor (contact person) in case of complaints. One contact person shall be assigned to the Project. The public notice shall encourage the adjacent residents to contact the construction supervisor in the case of a complaint. Resident’s will be informed if there is a change in the construction schedule. The supervisor shall be available 24/7 throughout construction by mobile phone. If a complaint is received, the contact person shall take all feasible steps to remove the sound source causing the complaint. A log of complaints shall be maintained at the project site.

NOI-8 During future construction activities with heavy equipment within 300 feet of occupied residences, vibration field tests should be conducted at the nearest occupied residences. To the extent feasible, if vibrations exceed 72 VdB, the construction activities shall be revised to reduce vibration below this threshold.

Tribal Cultural Resources

TCR-1 The San Manuel Band of Mission Indians Cultural Resources Department (SMBMI) shall be contacted, as detailed in CR-1, of any pre-contact cultural resources discovered during project implementation, and be provided information regarding the nature of the find, so as to provide Tribal input with regards to significance and treatment. Should the find be deemed significant, as defined by CEQA (as amended, 2015), a Cultural Resources Monitoring and Treatment Plan shall be created by the archaeologist, in coordination with SMBMI, and all subsequent finds shall be subject to this Plan. This Plan shall allow for a monitor to be present that represents SMBMI for the remainder of the project, should SMBMI elect to place a monitor on-site.

TCR-2 Any and all archaeological/cultural documents created as a part of the project (isolate records, site records, survey reports, testing reports, etc.) shall be supplied to the applicant and Lead Agency for dissemination to SMBMI. The Lead Agency and/or applicant shall, in good faith, consult with SMBMI throughout the life of the project.

REFERENCES

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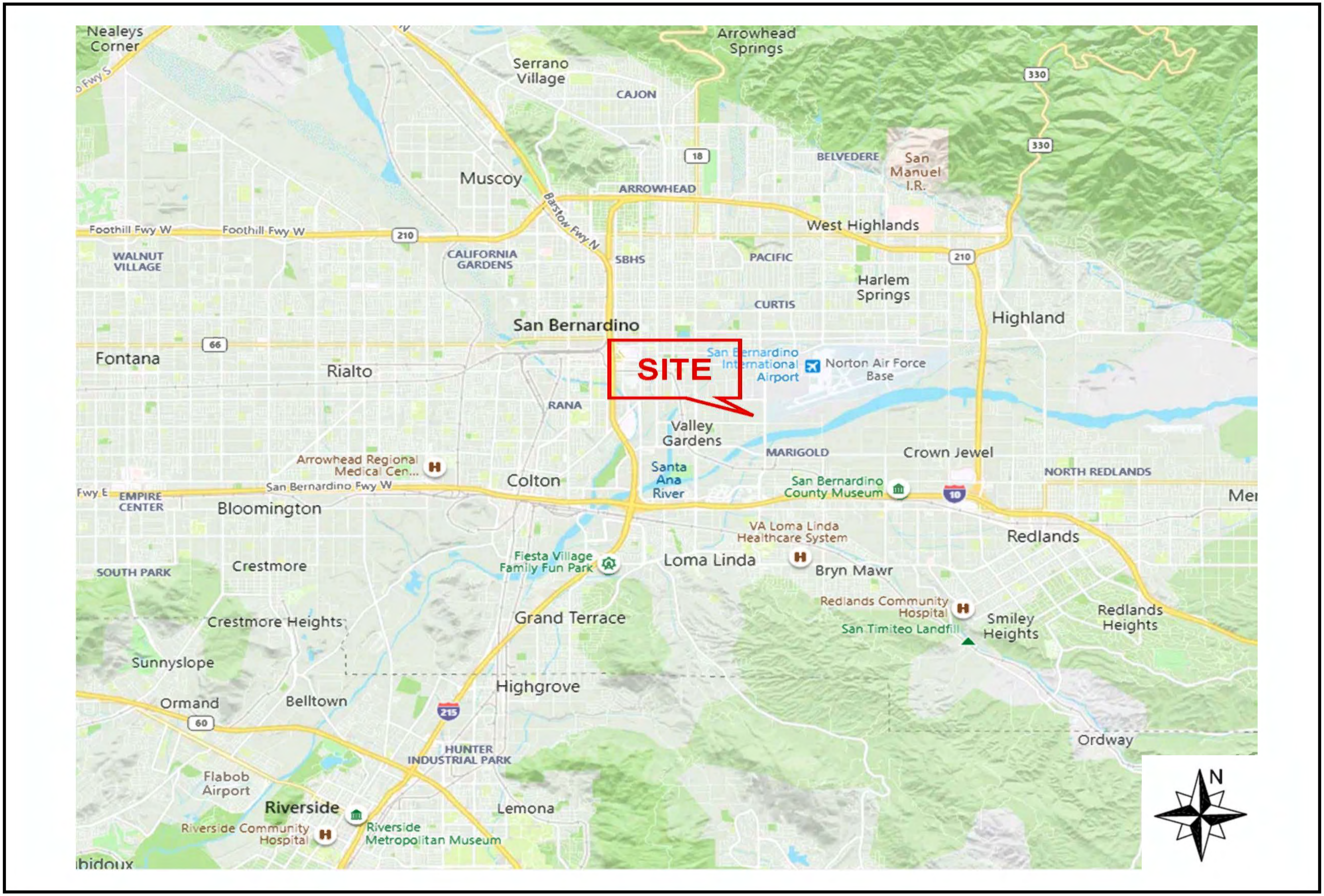
https://www2.calrecycle.ca.gov/LGCentral/AnnualReporting/ReviewReports/DisposalTonnageTrend

http://ceres.ca.gov/ceqa/guidelines/

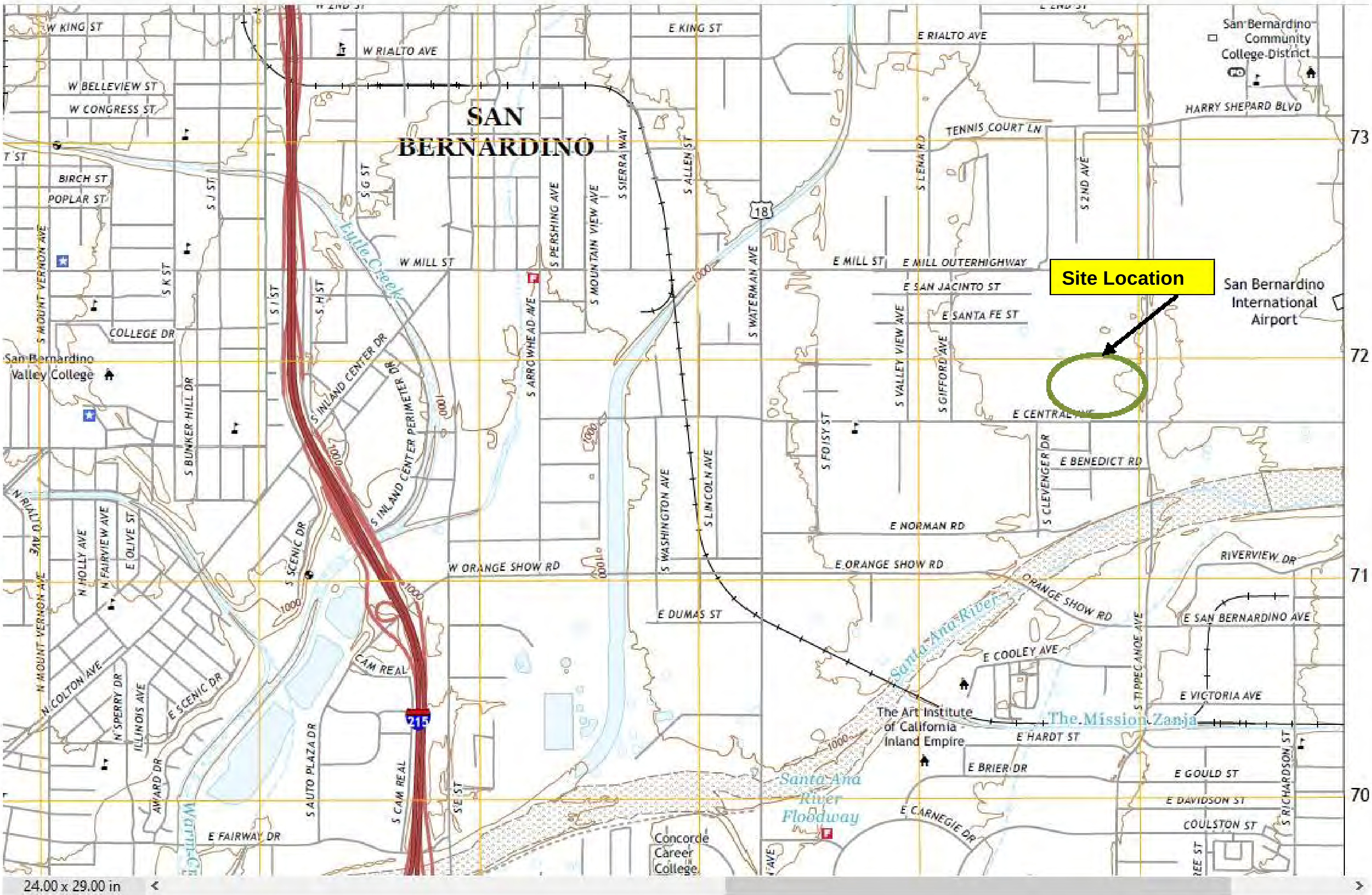
FIGURES



SOURCE: Taken from Geotechnical Engineering Report prepared by PSI, Inc. dated May 5, 2021

FIGURE 1

Tom Dodson & Associates *Environmental Consultants*	**Regional Location**



SOURCE: USGS San Bernardino South Quadrangle

FIGURE 2

Tom Dodson & Associates
Environmental Consultants

Site Location

FIGURE 3

Tom Dodson & Associates
Environmental Consultants

Aerial Photo of Site

GENERAL NOTES

1. ALL TRAFFIC CONTROL SIGNS SHALL BE FABRICATED AS SHOWN IN THE NATIONAL MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS EXCEPT AS NOTED ON THE PLANS.
2. ALL CURB RADII ARE SHOWN TO THE FACE OF CURB AND ALL DIMENSIONS ARE TO FACE OF CURB, WHERE APPLICABLE, UNLESS OTHERWISE NOTED.
3. ALL 3' GATES SHALL BE SPACED TO OPEN FREELY AND MISS ANY BOLLARDS WHEN OPENED
4. CONTRACTOR IS RESPONSIBLE FOR THE PROTECTION OF ALL PROPERTY CORNERS.
5. CONTRACTOR SHALL MATCH EXISTING PAVEMENT AND CURB & GUTTER IN GRADE, SIZE, TYPE, AND ALIGNMENT AT ADJACENT ROADWAYS/ DRIVEWAYS.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRS TO DAMAGE TO ANY EXISTING IMPROVEMENTS DURING
CONSTRUCTION, SUCH AS, BUT NOT LIMITED TO, DRAINAGE, UTILITIES, PAVEMENT, STRIPING, CURB, ETC. REPAIRS SHALL BE EQUAL TO OR BETTER THAN EXISTING CONDITIONS.
7. ALL PAVEMENT PAINT SHALL BE SHERWIN WILLIAMS "PROMAR TRAFFIC MARKING", WHITE ON ASPHALT, YELLOW ON CONCRETE. PAINT SHALL BE APPLIED IN TWO (2) COATS TO A CLEAN, DRY SURFACE USING TEMPLATE OR STRIPING MACHINE. STRIPES SHALL BE 4" WIDE UNLESS OTHERWISE NOTED.

PROJECT INFORMATION

PROJECT NAME: CNG FUELING STATION

PROJECT ADDRESS: E CENTRAL AND S TIPPECANOE AVENUE
PROJECT DESCRIPTION: INSTALLATION OF COMPRESSED NATURAL GAS VEHICLE FUELING STATION, VEHICLE PARKING AND WITH ASSOCIATED CONTROLS EQUIPMENT PADS, INTERCONNECTING PIPING, ELECTRICAL, SAFETY SYSTEMS, AND OTHER MINOR SITE WORK AT THE PROJECT SITE LISTED ABOVE.

ZONING INFORMATION

JURISDICTION: SAN BERNARDINO CITY
ZONING CLASSIFICATION: INDUSTRIAL LIGHT
PLANNED LAND USE:

SITE DATA:

APN:	028009127
GROSS PARCEL AREA:	6.36 AC
RIGHT OF WAY DEDICATION:	0 SF (0 AC)
NET SITE AREA:	6.36 AC
LANDSCAPE AREA:	36,859 SF (0.84AC)
PROPOSED FAST FILL AND EQUIPMENT COMPOUND AREA:	67,230 SF (1.54 AC)
PROPOSED PARKING LOT:	185,350 SF (4.20 AC)

OCCUPANCY CLASSIFICATION:

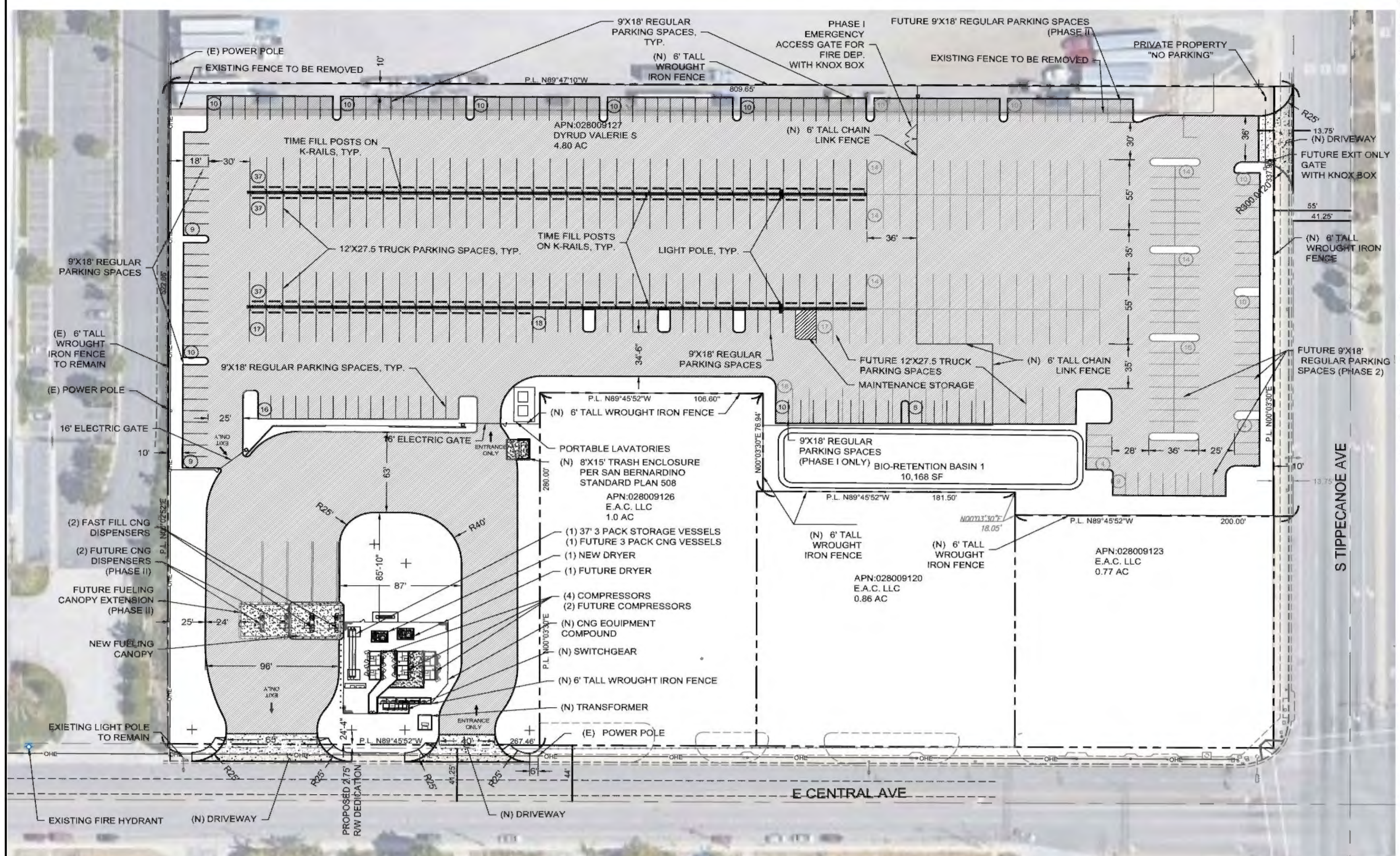
GROUP M - MERCANTILE

TYPE OF CONSTRUCTION

II-A

PROPOSED PARKING SUMMARY

PARKING:	REQUIRED	PHASE I	BUILD-OUT
STANDARD 9'X18'	0	128	213
TRACTOR 12'X27.5':	0	0	77
TRACTOR TIME-FILL 12'X27.5':	0	128	128
TOTAL PROPOSED PARKING:	0	256	418



PRELIMINARY SITE PLAN

CNG FUELING STATION
SAN BERNARDINO CNG FUELING STATION
E. CENTRAL AVE
SAN BERNARDINO, CA
PRELIMINARY SITE PLAN
ASSET NO:20081

DATE 10/27/2021 DRAWN BY: PB CHECKED BY: ML
SCALE AS NOTED
SHEET C1.0

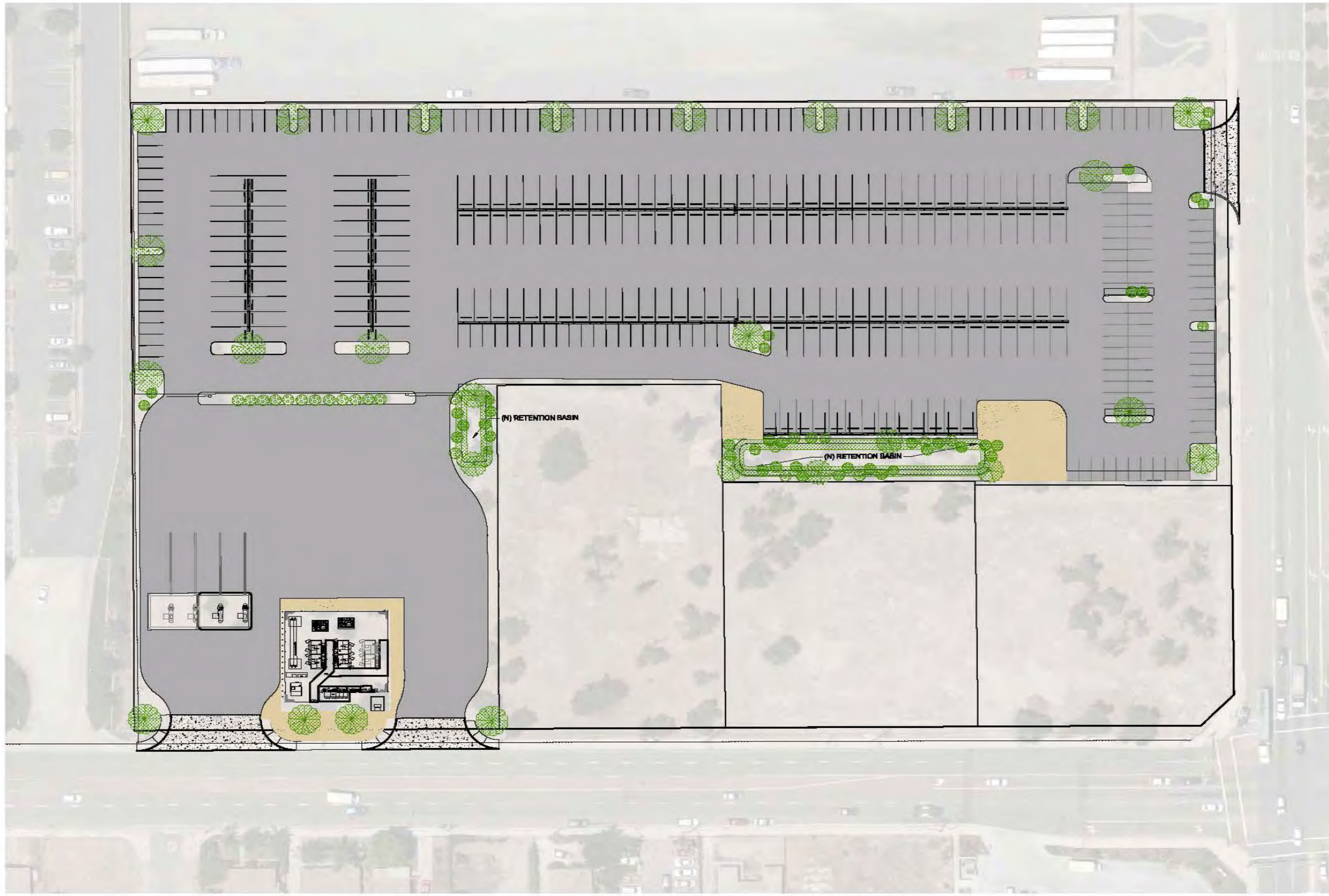
0 10/28/2021 ISSUED FOR REVIEW ML
REV DATE REVISIONS BY

10/27/2021 4:00:01 PM

FIGURE 4

Tom Dodson & Associates
Environmental Consultants

Preliminary Site Plan



PRELIMINARY LANDSCAPE PLAN

0 40 80 Feet

PROPOSED PLANT PALETTE

SYMBOL	BOTANICAL / COMMON NAME
	PROPOSED TREES (PER WUCOLS REGION 4)
	COMMON YARROW (ACHILLEA MELLEFOLIUM) - 5GAL
	FALSE INDIGO-BUSH - 5GAL
	PERIMETER WAX MYRTLES - 5GAL
	PLATANUS ACERIFOLIA 'COLUMBIA'/ LONDON PLANE TREE (STREET TREE) - 24" BOX
	PLATANUS RACEMOSA / CALIFORNIA SYCAMORE (RETENTION BASIN TREE) - 15 GAL
	GEIJERA PARVIFOLIA / AUSTRALIAN WILLOW - 15 GAL
	'NO MOW' FINE FESCUE BLEND ORNAMENTAL GRASS BIO-RETENTION AREA. SOD AVAILABLE THROUGH PACIFIC SOD (800) 942-5296

SITE DATA:

APN:	028009127
GROSS PARCEL AREA:	6.36 AC
RIGHT OF WAY DEDICATION:	0 SF (0 AC)
NET SITE AREA:	277,041 SF (6.36 AC)
LANDSCAPE AREA:	36,859 SF (0.84AC)

PAVEMENT LEGEND

- BIO-RETENTION BASIN 9,748 SF
- PROPOSED ASPHALT PAVEMENT 232,108 SF
- PROPOSED CONCRETE PAVEMENT 8,074 SF
- DECORATIVE LANDSCAPE ROCKS ("GOLD" DECOMPOSED GRANITE 3/4") 8,659 SF

LANDSCAPE NOTES

- **IRRIGATION SYSTEM CONCEPT:**
  All planted areas shall be irrigated according to plant type groupings and environmental exposure and shall receive uniform water coverage as required by State Mandated AB 1881. Irrigation watering shall be by means of a Weather Sensing Automatic Irrigation Controller system with a Rain Sensor. The irrigation system shall be capable of short repeat cycles in order to apply water at a rate that can be absorbed into the soil. A master control valve will be installed to prevent over watering if a valve malfunctions. Pop-up spray heads will be avoided whenever possible with water delivered through a drip / emitter system. Recycled or Reclaimed Water will be used if available. A Domestic Water Irrigation system will utilize a Reduced Pressure Backflow Preventer to protect the Domestic drinking water from inadvertent cross contamination.

- **LANDSCAPE PLANTING CONCEPT:**
  The Landscape Planting will provide a visual continuity of design to intergrate with existing commercial and industrial developments. The landscape will compliment the architecture whenever possible, for example softening walls used to screen service areas with trees, shrubs and vines. Line-of-Sight clearance for automobile traffic and pedestrian traffic and visual access to signs are observed and accounted for in the design.

  All plant materials are selected for temperate hardiness and low water use requirements. Specialized plant materials will be utilized within the proposed landscaped Bio-Swale with a separate Precision Spray irrigation watering system. A 2" layer of decomposed granite mulch will be installed to help reduce water evaporation between irrigation cycles.

0 | 05/12/2021 | PLANNING SUBMITTAL 1ST REVIEW
REV | DATE | REVISIONS

DIGALERT
Know what's below. CALL 811 before you dig.

Clean Energy

CNG FUELING STATION
SAN BERNARDINO CNG FUELING STATION
E. CENTRAL AVE
SAN BERNARDINO, CA
PRELIMINARY LANDSCAPE

DATE 05/05/2021	DRAWN BY: PB	CHECKED BY: ML	
SCALE	AS NOTED		
SHEET	C1.1		

REGISTERED PROFESSIONAL ENGINEER
C 63003
STATE OF CALIFORNIA

2021/05/12

5/12/2021 2:00:21 PM

FIGURE 5

Preliminary Landscape

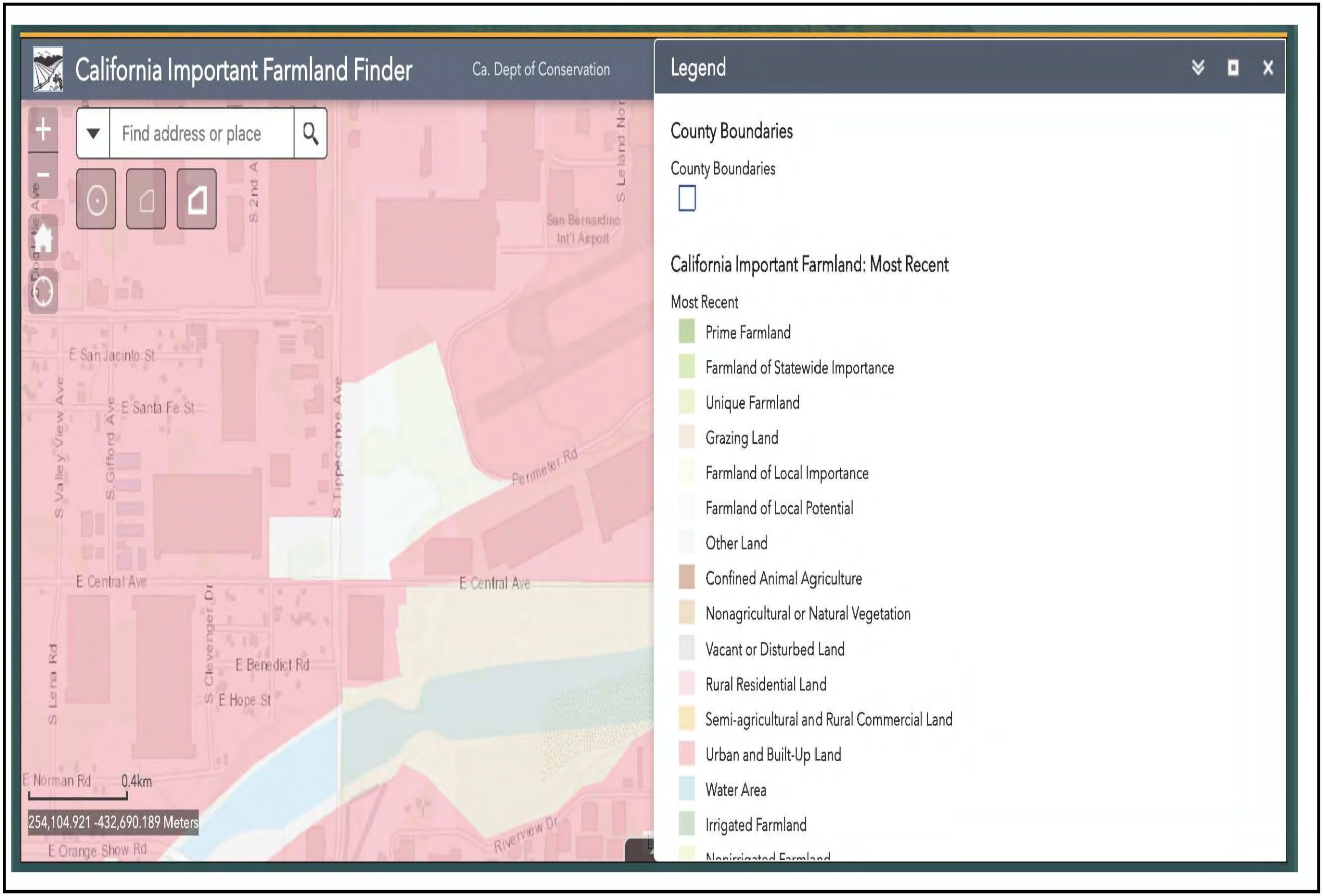


FIGURE II-1

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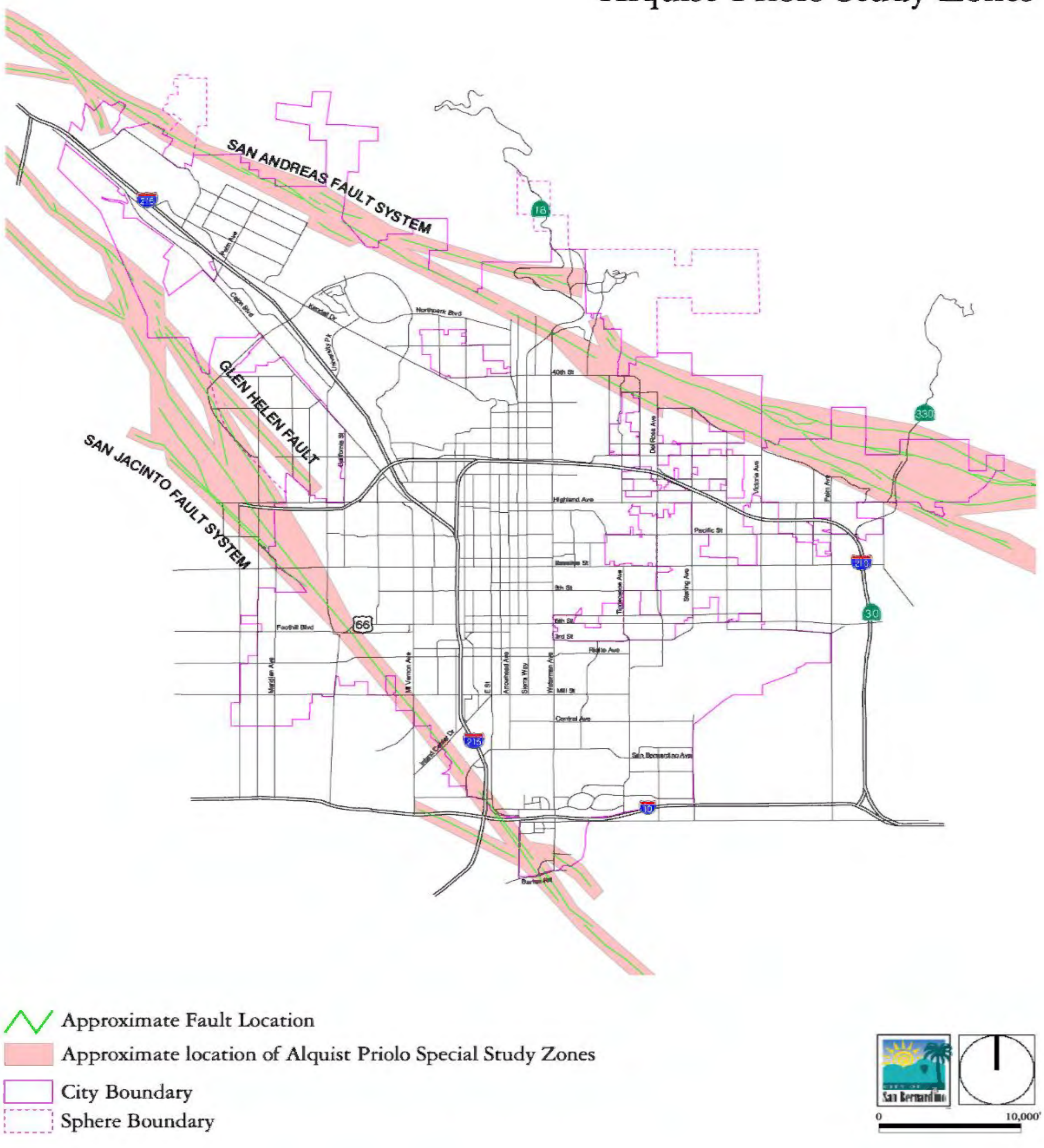
Environmental Consultants

Farmland Map

Alquist-Priolo Study Zones



The City of
SAN BERNARDINO
General Plan

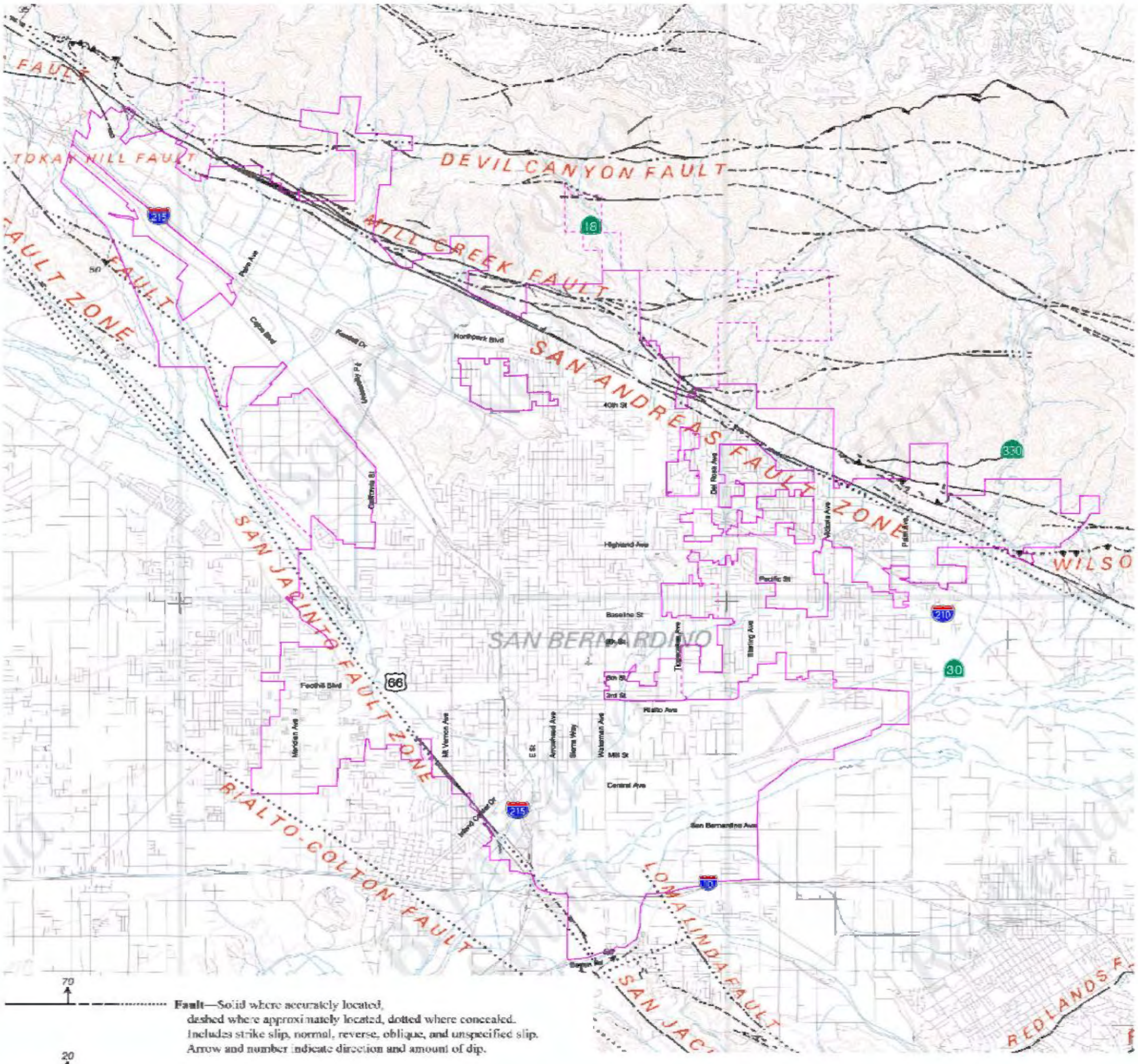
Figure S-3

FIGURE VII-1

Tom Dodson & Associates
Environmental Consultants

Alquist-Priolo Study Zones

Regional Faults



70

Fault—Solid where accurately located, dashed where approximately located, dotted where concealed. Includes strike slip, normal, reverse, oblique, and unspecified slip. Arrow and number indicate direction and amount of dip.

20

Thrust fault—Teeth on upper plate; solid where accurately located, dashed where approximately located, dotted where concealed. Arrow and number indicate direction and amount of dip.

Rotational slip normal fault—Bars on hanging wall side; solid where accurately located, dashed where approximately located, dotted where concealed.

City Boundary

Sphere Boundary

0 10,000'

The City of
SAN BERNARDINO
General Plan

Figure S-4

FIGURE VII-2

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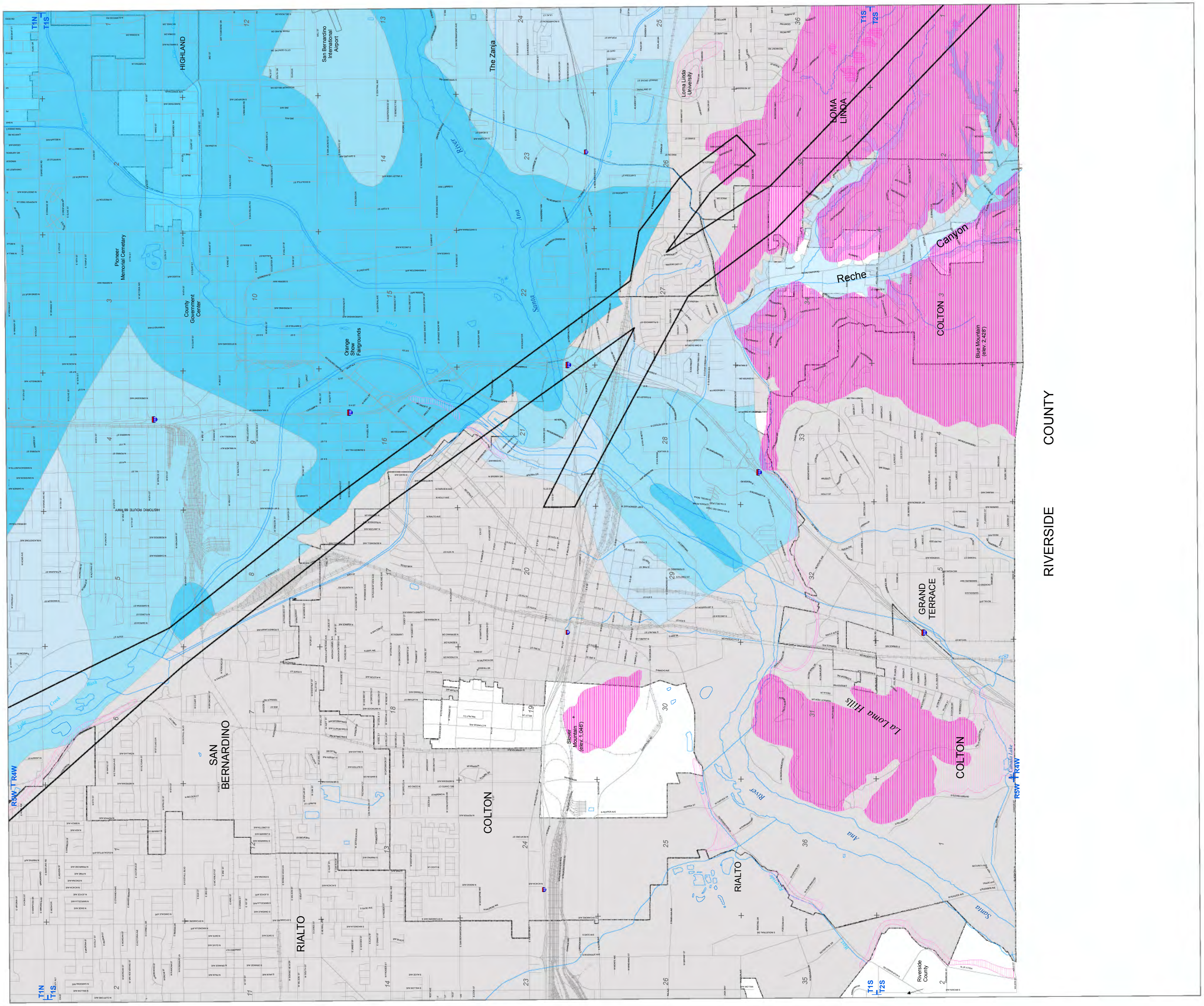
Environmental Consultants

Regional Faults

See FH31 C

See FH22 C



See FH29 C

FH30 C
San Bernardino S

San Bernardino County Land Use Plan
GENERAL PLAN
Geologic Hazard Overlays

SCALE 1:14,400

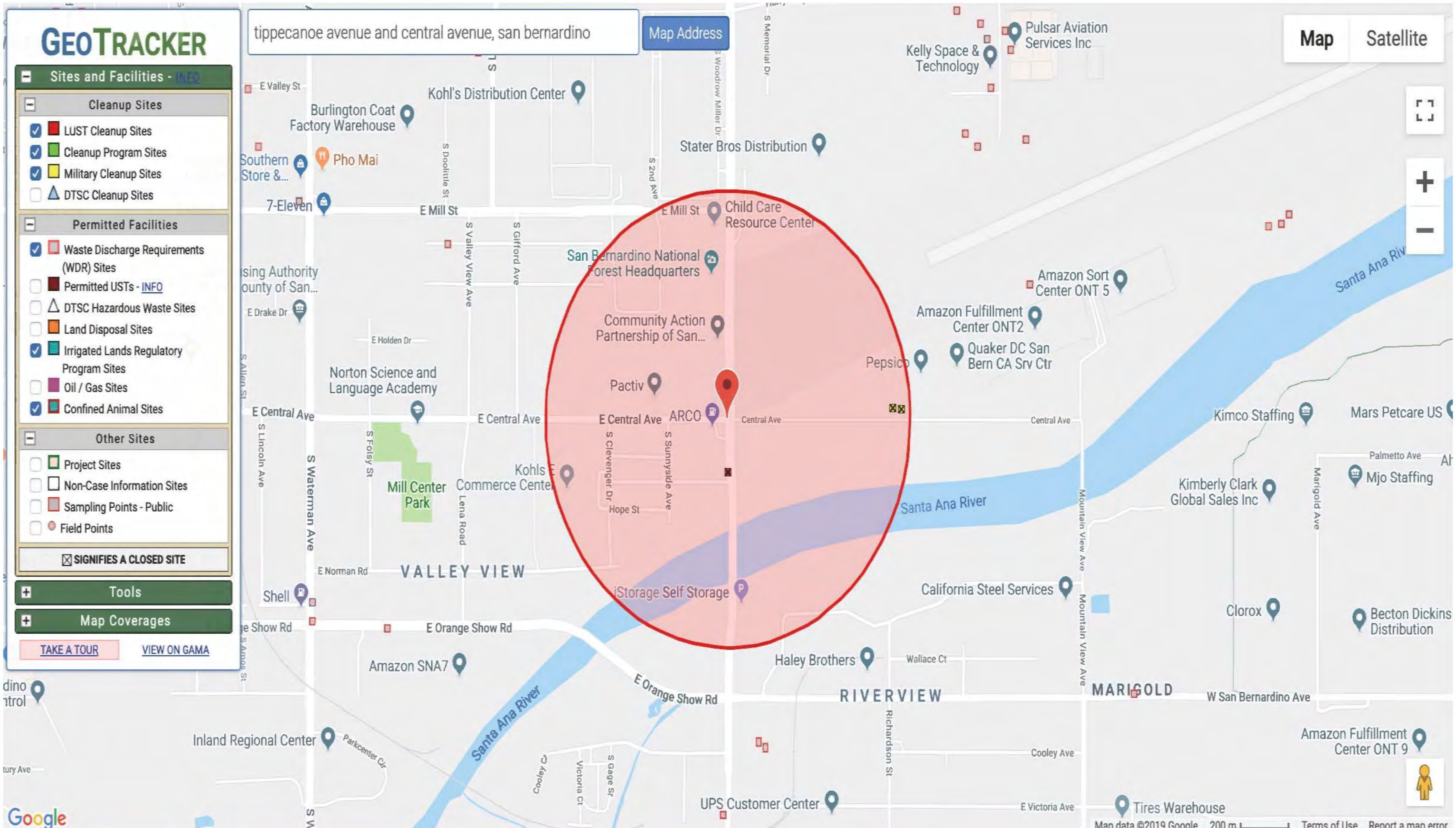
Earthquake Fault Zones
Earthquake Fault Zone Boundary
County Designated Fault Zones

Generalized Liquefaction Susceptibility
Low
Medium
High

Zone of Suspected Liquefaction Susceptibility
Zone of Susceptibility

Generalized Landslide Susceptibility
Low to moderate
Moderate to high
Mapped, Existing Landslide
Rockfall/Debris-Flow Hazard Area (Forest Falls Only)

FIGURE VII-3



SITES FOUND IN SEARCH RADIUS — 3 SITES LISTED — EXPORT THIS LIST TO EXCEL

SITE NAME	GLOBAL ID	STATUS	ADDRESS	CITY
NORTON AIR FORCE BASE - US AIR FORCE, FORMER NORTON AFB - BASEWIDE OU - SITE 17 DRUMMED WASTE STORAGE AREA/WASTE FUEL AND SOLVENT SUMP	DOD100362800	COMPLETED - CASE CLOSED	CENTRAL AVENUE	SAN BERNARDINO
NORTON AIR FORCE BASE - US AIR FORCE, FORMER NORTON AFB - BASEWIDE OU - SITE 7 IWTP SLUDGE DRYING BEDS	DOD100362500	COMPLETED - CASE CLOSED		SAN BERNARDINO
ORBIT STATIONS INC.	T0607100172	COMPLETED - CASE CLOSED	908 TIPPECANOE AVE	SAN BERNARDINO

FIGURE IX-1

Tom Dodson & Associates
Environmental Consultants

GeoTracker, page 1

STATE WATER RESOURCES CONTROL BOARD

GEOTRACKER

US AIR FORCE, FORMER NORTON AFB - BASEWIDE OU - SITE 7 IWTP SLUDGE DRYING BEDS (DOD100362500) - (MAP)

SIGN UP FOR EMAIL ALERTS

SAN BERNARDINO, CA
SAN BERNARDINO COUNTY
MILITARY CLEANUP SITE (INFO)
PRINTABLE CASE SUMMARY / CSM REPORT

CLEANUP OVERSIGHT AGENCIES
DEPARTMENT OF TOXIC SUBSTANCES CONTROL *(LEAD) - CASE #: CA4570024345*
SANTA ANA RWQCB (REGION 8) *(LEAD) - CASE #: 166-71 – 15*
CASEWORKER: PATRICIA HANNON
US ENVIRONMENTAL PROTECTION AGENCY *(LEAD) - CASE #: 400108 – 15*

Summary | Cleanup Action Report | Regulatory Activities | *Environmental Data (ESI)* | Site Maps / Documents | Community Involvement | *Related Cases*

Regulatory Profile

PRINTABLE CASE SUMMARY

MILITARY BASE
NORTON AIR FORCE BASE
CLEANUP STATUS - DEFINITIONS
COMPLETED - CASE CLOSED AS OF 4/25/2006 - CLEANUP STATUS HISTORY
POTENTIAL CONTAMINANTS OF CONCERN
ARSENIC, CHROMIUM, COPPER, METALS, NICKEL, PAHS/PNAS, PESTICIDE/HERBICIDES, POLYCHLORINATED BIPHENYLS (PCBS)
POTENTIAL MEDIA OF CONCERN
NONE SPECIFIED
FILE LOCATION
ARCHIVED
DESIGNATED GROUNDWATER BENEFICIAL USE(S) - DEFINITIONS
MUN, AGR, IND, PROC
DWR GROUNDWATER SUB-BASIN NAME
Upper Santa Ana Valley - San Bernardino (8-002.06)
CALWATER WATERSHED NAME
Santa Ana River - Upper Santa Ana River - Bunker Hill (801.52)

Site History

Installation Restoration Program (IRP) Site 7 was the sludge drying beds for the former industrial waste treatment plant (IWTP). Site 5 was located in the southeast corner of the former IWTP compound. The site was investigated under the IRP. The closure of former IWTP was completed under the Resource Conservation Recovery Act (RCRA) corrective action termination for an interim status facility. The site included 12 concrete-walled, unlined sludge-drying beds, covering approximately 17,280 square feet. The beds were use to dry sludge generated at the IWTP until 1987. During removal of the sludge, it was temporarily stored at the northeast corner of the site. Sampling during the IRP and 1991 Remedial Investigation indicated some metal concentrations above background concentrations in near-surface samples.

A partial listing of investigations and reports performed prior to site remediation and closure: 1982) Records Search for Norton AFB; 1985) Final Phase II, Stage I Technical Report, Problem Confirmation/Quantification Study; 1987) Phase II, Stage 2 Confirmation/Quantification Report; 1989) Final Draft Stage 3 Report;
1992) RI Report, IRP Sites; 1993) Final RI Report, IRP Sites Operable Unit; 1995) Technical Memorandum, Development and Evaluation of Soil Target Cleanup Goals, Industrial/Commercial Reuse Scenario, IRP Sites Cleanup; 1995) Engineering Evaluation/Cost Analysis; and 1997) Revised Final Action Memorandum.

FIGURE IX-2

GeoTracker, page 2

In 1999, the Department of Toxic Substances Control requested as part of the RCRA closure evaluation for the IWTP, sampling of the concrete walls and soils within the former waste pile area. Sampling was performed in January 2000. Samples were analyzed for metals, radionuclides, chlorinated pesticides, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs). Low concentrations of pesticides, PCBs and PAHs were reported and metals and radionuclides reflected background ranges. The waste pile had been located on weathered asphalt. An additional soil sampling of the former waste pile area resulted in detection of cadmium, bezo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and dibenzo(a,h)anthracene at concentrations exceeding the residential preliminary remediation goals (PRGs).

In order to eliminate the remaining sludge drying bed structures and reduce concentrations of PAHs in soil to acceptable levels soil removal actions were completed in the sludge storage area and the drying beds area. On December 24, 2003, a 25 foot (ft) by 15 ft area of soil was removed from the sludge storage area. On March 4, 2004 an additional 45 ft by 15 feet area of soil was removed from the sludge storage area. On March 5, 2004 a 260 ft by 80 ft area of soil and concrete walls was removed from the sludge drying beds area. Soil was excavated in 6 inch lifts and transported off site for disposal. The soil removal actions resulted in PAH concentrations near or below residential PRGs.

Final Revised Closure Certification Report for Site 7 was issued and dated December 2005.

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FIGURE IX-3

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Environmental Consultants

GeoTracker, page 3

STATE WATER RESOURCES CONTROL BOARD
GEOTRACKER

US AIR FORCE, FORMER NORTON AFB - BASEWIDE OU - SITE 17 DRUMMED WASTE STORAGE AREA/WASTE FUEL AND SOLVENT SUMP (DOD100362800) - (MAP)

SIGN UP FOR EMAIL ALERTS

CENTRAL AVENUE
SAN BERNARDINO, CA
SAN BERNARDINO COUNTY
MILITARY CLEANUP SITE (INFO)
PRINTABLE CASE SUMMARY / CSM REPORT

CLEANUP OVERSIGHT AGENCIES
DEPARTMENT OF TOXIC SUBSTANCES CONTROL *(LEAD) - CASE #: CA4570024345*
SANTA ANA RWQCB (REGION 8) *(LEAD) - CASE #: 166-71 – 12*
CASEWORKER: PATRICIA HANNON
US ENVIRONMENTAL PROTECTION AGENCY *(LEAD) - CASE #: 400108 – 12*

Summary | Cleanup Action Report | Regulatory Activities | *Environmental Data (ESI)* | Site Maps / Documents | Community Involvement | *Related Cases*

Regulatory Profile

PRINTABLE CASE SUMMARY

MILITARY BASE
NORTON AIR FORCE BASE

CLEANUP STATUS - DEFINITIONS
COMPLETED - CASE CLOSED AS OF 11/28/2006 - CLEANUP STATUS HISTORY

POTENTIAL CONTAMINANTS OF CONCERN
TRICHLOROETHYLENE (TCE)

POTENTIAL MEDIA OF CONCERN
AQUIFER USED FOR DRINKING WATER SUPPLY, SOIL

FILE LOCATION
LOCAL AGENCY WAREHOUSE

DESIGNATED GROUNDWATER BENEFICIAL USE(S) - DEFINITIONS
MUN, AGR, IND, PROC

DWR GROUNDWATER SUB-BASIN NAME
Upper Santa Ana Valley - San Bernardino (8-002.06)

CALWATER WATERSHED NAME
Santa Ana River - Upper Santa Ana River - Bunker Hill (801.52)

Site History

Installation Restoration Program (IRP) Site 17 was the drummed waste storage area and waste fuel and solvent sumps. It was located along the former southern base boundary just south of the former Industrial Waste Treatment Plant (IWTP). The area south of the sumps was used for the storage of 55-gallon drums containing solvent and plating wastes. The waste material reportedly stored at the site included cyanide solutions, chromic acids, nickel electroplating solutions, trichloroethylene (TCE) sludge, phenol-based paint strippers, toluene, and waste paint thinners. The waste fuel and solvent sumps were originally intended to be burn-cells for fuel and chemical wastes; the State of California prohibited this action in 1961 following one test burn. The sumps were used until 1985 as holding tanks for skimmed materials form the IWTP oil/water separator. Site 17 was first identified as an IRP Site in 1984.

A partial listing of investigations and reports performed prior to site remediation and closure: 1982) Records Search for Norton AFB; 1985) Final Phase II, Stage I Technical Report, Problem Confirmation/Quantification Study; 1987) Phase II, Stage 2 Confirmation/Quantification Report; 1989) Final Draft Stage 3 Report;
1992) RI Report, IRP Sites; 1993) Final RI Report, IRP Sites Operable Unit; 1995) Technical Memorandum, Development and Evaluation of Soil Target Cleanup Goals, Industrial/Commercial Reuse Scenario, IRP Sites Cleanup; 1995) Engineering Evaluation/Cost Analysis; 1997) Revised Final Action Memorandum; and 2000) Technical Memorandum.

December 15 through December 24, 2003 the surface impoundments or sumps were dismantled and removed. One hundred cubic yards (cy) of demolished sumps and concrete materials

FIGURE IX-4

were transported as non-hazardous waste to a concrete waste disposal facility.

March 22 through April 30, 2004, Soil confirmation samples sump removal, soil samples, and vapor sample were collected and analyzed for contaminants of concern of volatile organic compounds, polycyclic aromatic hydrocarbons, semi-volatile organic compounds, polychlorinated biphenyls, metals, dioxin/furan, and radionuclides.

May 23 through August 4, 2006, 350 cy of non-hazardous contaminated soil was removed from beneath the former sumps and transported for disposal. The excavation was 60 feet by 30 feet by 10 feet deep. Confirmation samples were collected from the excavation. The site was backfilled with clean material.

FIGURE IX-5

Tom Dodson & Associates
Environmental Consultants

GeoTracker, page 5

STATE WATER RESOURCES CONTROL BOARD

GEOTRACKER

Tools | Reports | UST Case Closures | Information

ORBIT STATIONS INC. (T0607100172) - (MAP)

SIGN UP FOR EMAIL ALERTS

908 TIPPECANOE AVE
SAN BERNARDINO, CA 92410
SAN BERNARDINO COUNTY
LUST CLEANUP SITE (INFO)
PRINTABLE CASE SUMMARY / CSM REPORT

CLEANUP OVERSIGHT AGENCIES
SAN BERNARDINO COUNTY *(LEAD)* - *CASE #: 87060*
SANTA ANA RWQCB (REGION 8) - *CASE #: 083601435T*
CASEWORKER: *PATRICIA HANNON*

Summary | Cleanup Action Report | Regulatory Activities | *Environmental Data (ESI)* | *Site Maps / Documents* | Community Involvement | *Related Cases*

Regulatory Profile

PRINTABLE CASE SUMMARY

CLEANUP STATUS - DEFINITIONS

COMPLETED - CASE CLOSED AS OF 2/20/1990 - CLEANUP STATUS HISTORY

POTENTIAL CONTAMINANTS OF CONCERN
GASOLINE

POTENTIAL MEDIA OF CONCERN
SOIL

FILE LOCATION
LOCAL AGENCY

DESIGNATED GROUNDWATER BENEFICIAL USE(S) - DEFINITIONS
MUN, AGR, IND, PROC

DWR GROUNDWATER SUB-BASIN NAME
Upper Santa Ana Valley - San Bernardino (8-002.06)

CALWATER WATERSHED NAME
Santa Ana River - Upper Santa Ana River - Bunker Hill (801.52)

Site History

No site history available

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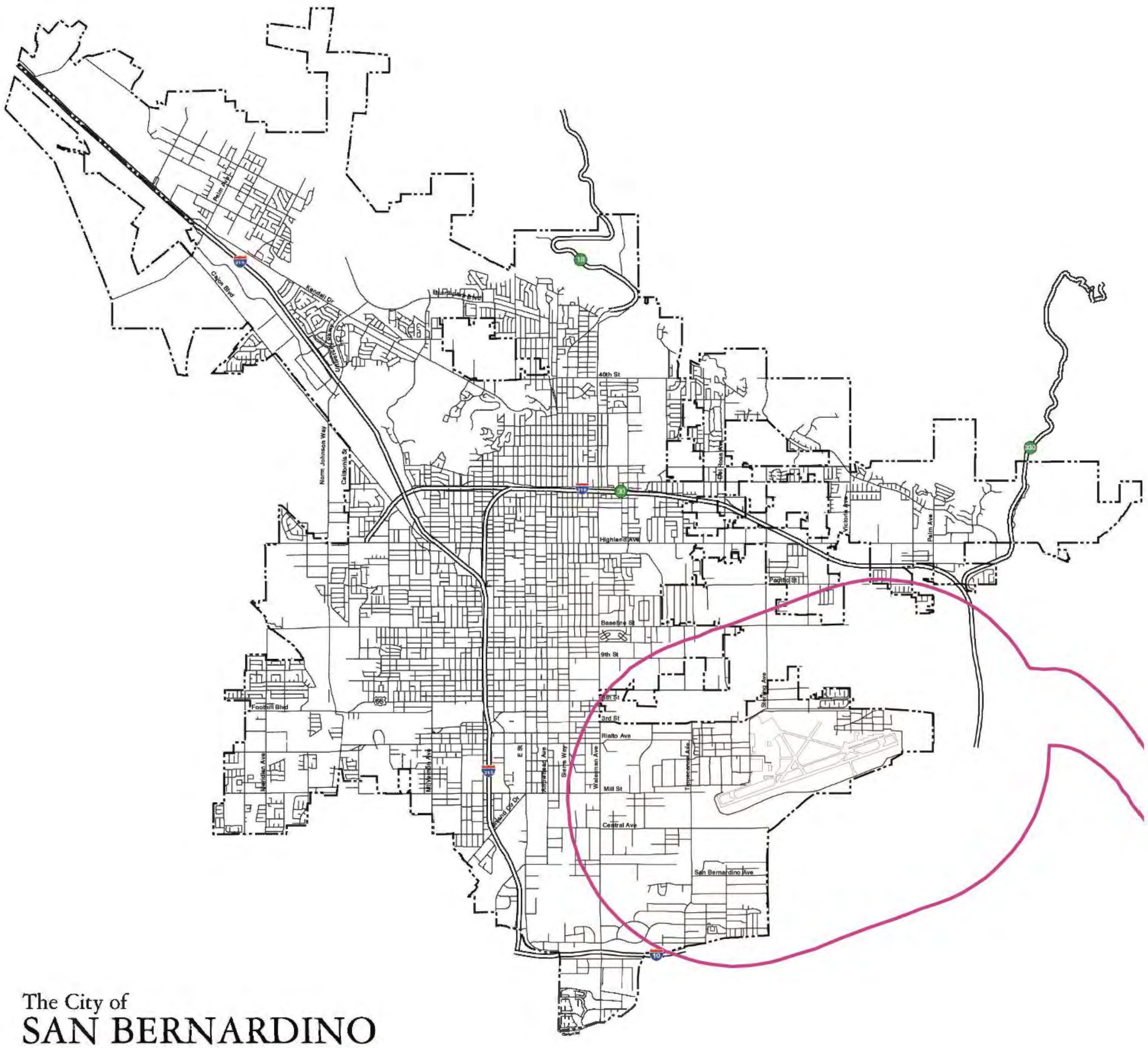
FIGURE IX-6

San Bernardino International Airport Planning Boundaries



Airport Influence Area
City Boundary

To be included upon adoption of the Comprehensive Land Use Plan for the SBIA, as may be appropriate:

Runway Protection Zone
Inner Turning Zone
Inner Safety Zone
Outer Safety Zone
Traffic Pattern Zone
CNEL Noise Contours

Note: As of the adoption of this General Plan, the Airport Master Plan and the Comprehensive Land Use Plan (CLUP) for the San Bernardino International Airport (SBIA) were in the process of being prepared. As a consequence, the precise noise contours and safety zones were not available to include in this Plan. Upon adoption of the Airport Master Plan and CLUP for the SBIA, the new noise and safety zones will be incorporated into this Figure and, if necessary, the Airport Influence Area adjusted.

0' 7,000'

The City of
SAN BERNARDINO
General Plan

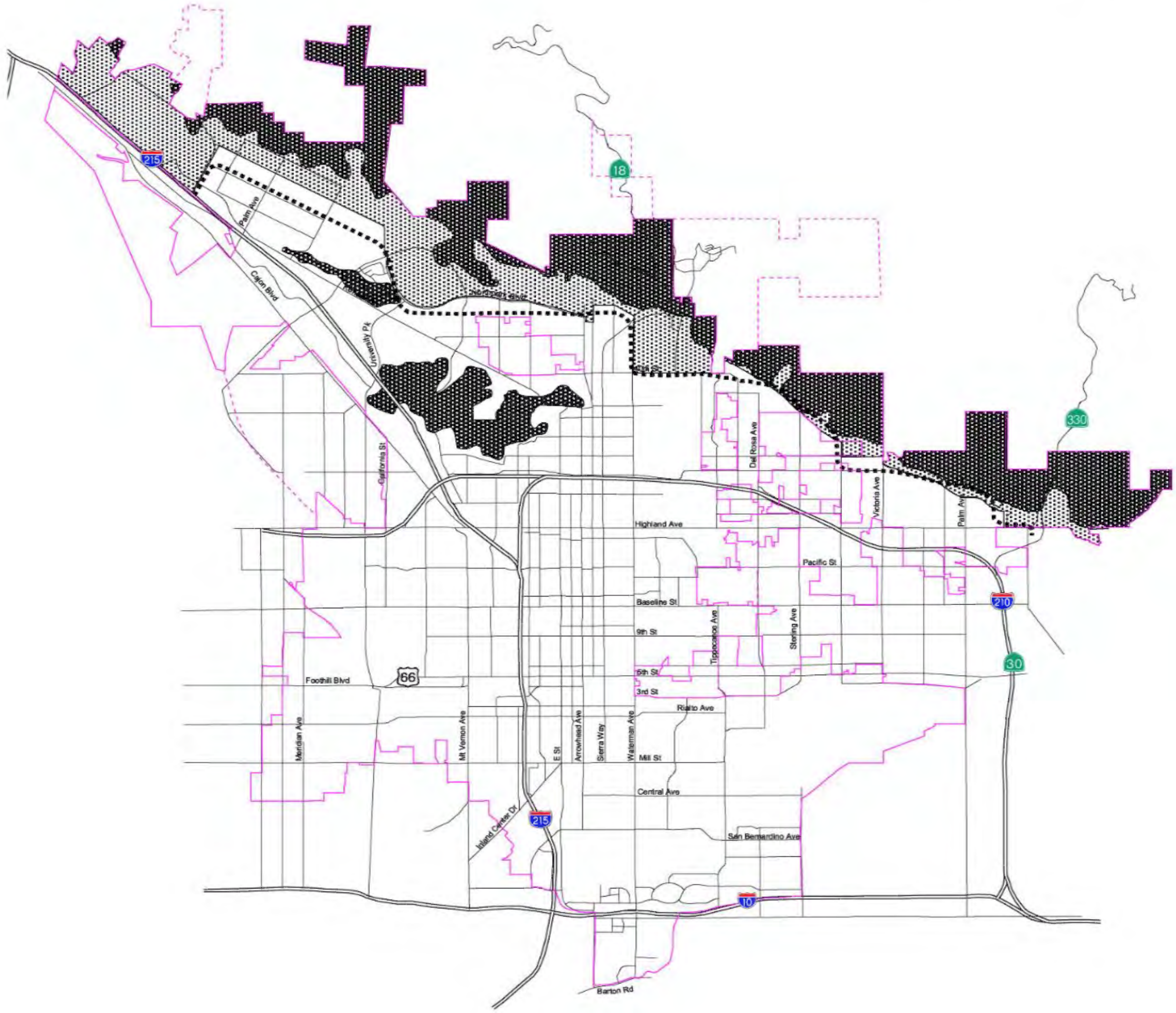
Figure LU-4

FIGURE IX-7

Tom Dodson & Associates
Environmental Consultants

San Bernardino International Airport Planning Boundaries

Fire Hazard Areas



Extreme Fire Hazard Area
Moderate Fire Hazard Area
City High Fire Hazard Line
City Boundary
Sphere of Influence Boundary

(Source: City of San Bernardino)

0 10,000'

The City of
SAN BERNARDINO
General Plan

Figure S-9

FIGURE IX-8

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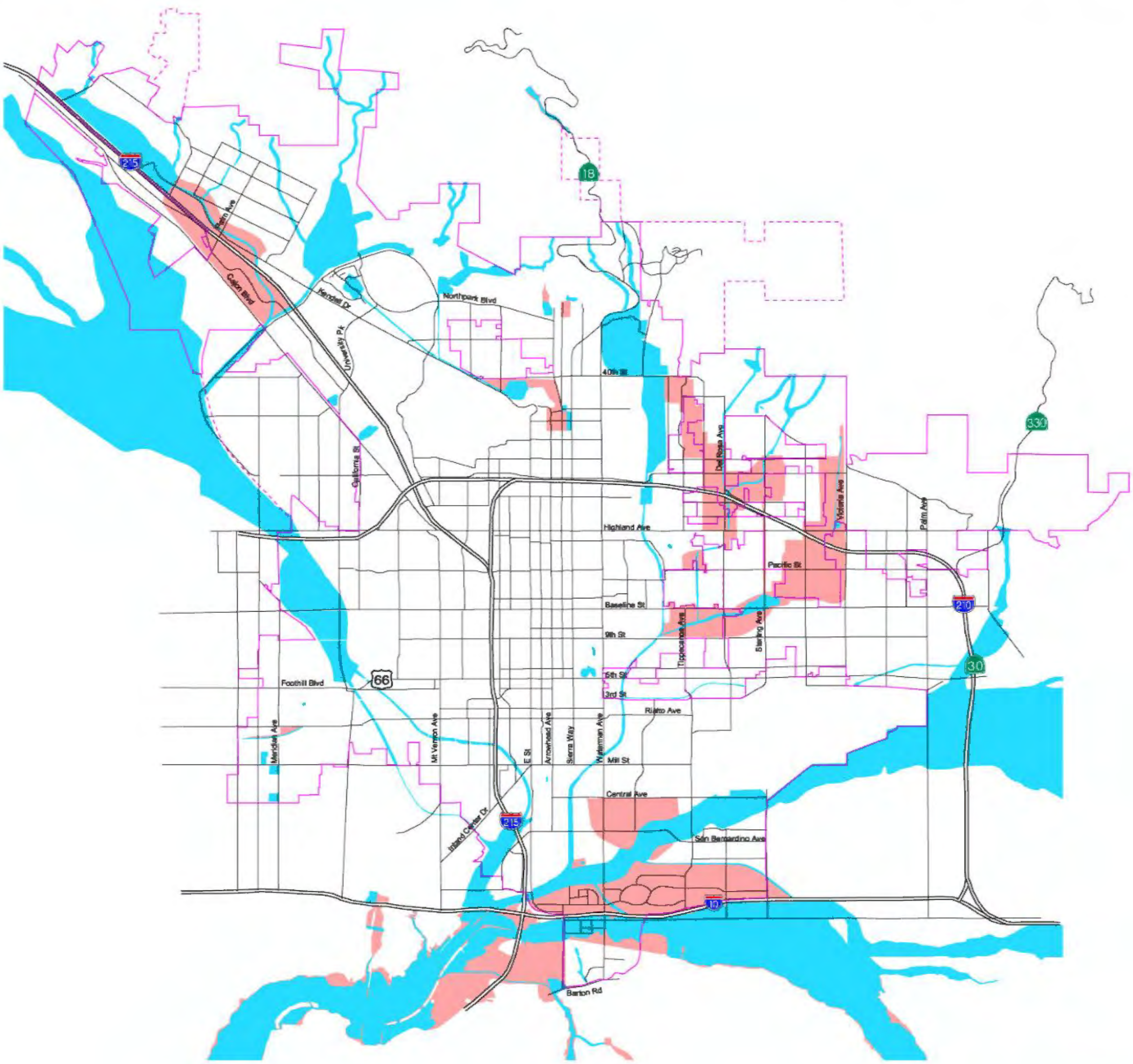
Environmental Consultants

Fire Hazard Areas

100-Year Flood Plain



Source: Federal Emergency Management Agency Flood Insurance Rate Maps. Date: 1990

- 100-Year Flood Zone
- 500-Year Flood Zone
- City Boundary
- Sphere of Influence Boundary

0 10,000'

The City of
SAN BERNARDINO
General Plan

Figure S-1

FIGURE X-1

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Environmental Consultants

100-Year Floodplain

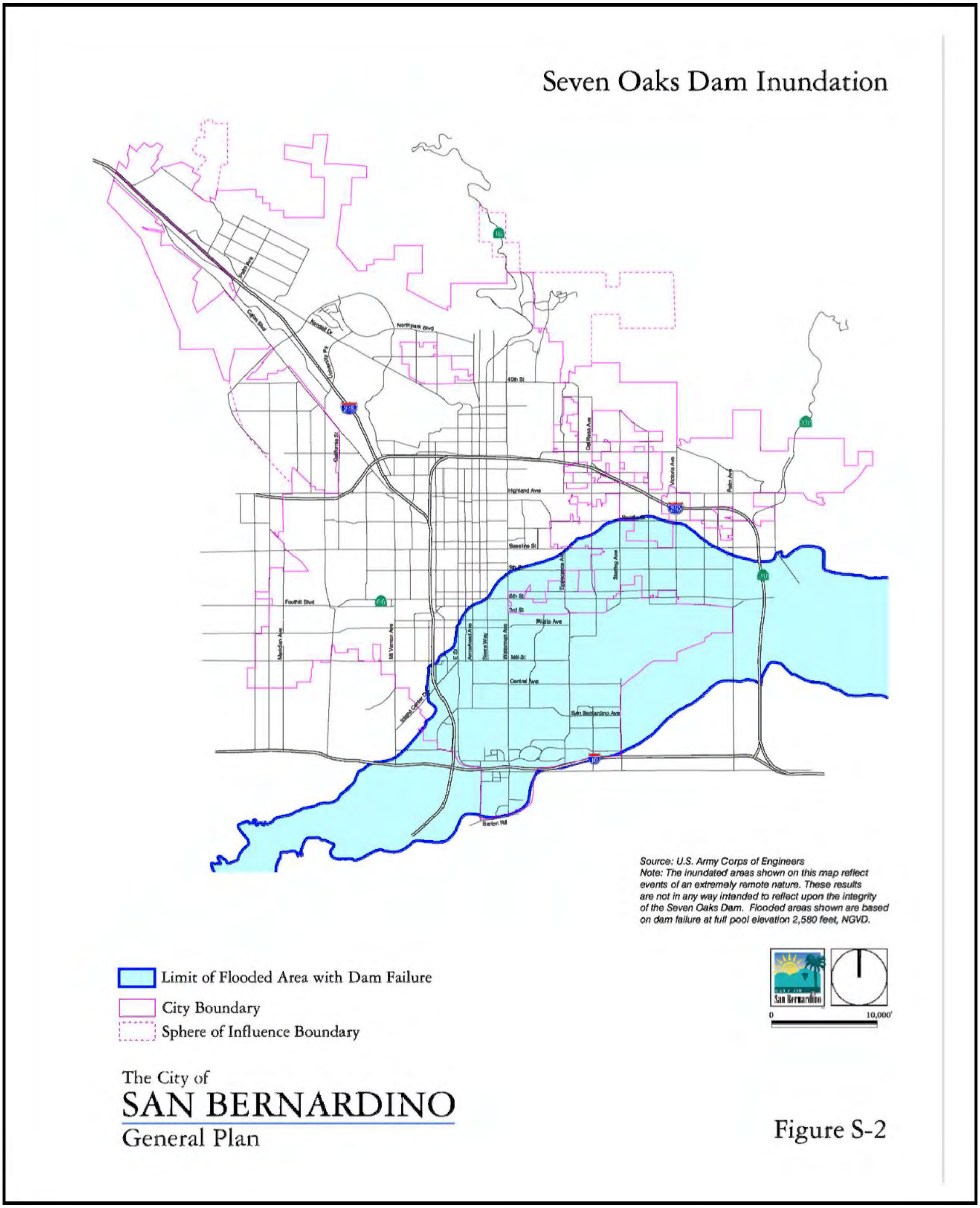

FIGURE X-2

Tom Dodson & Associates
Environmental Consultants

Seven Oaks Dam Inundation

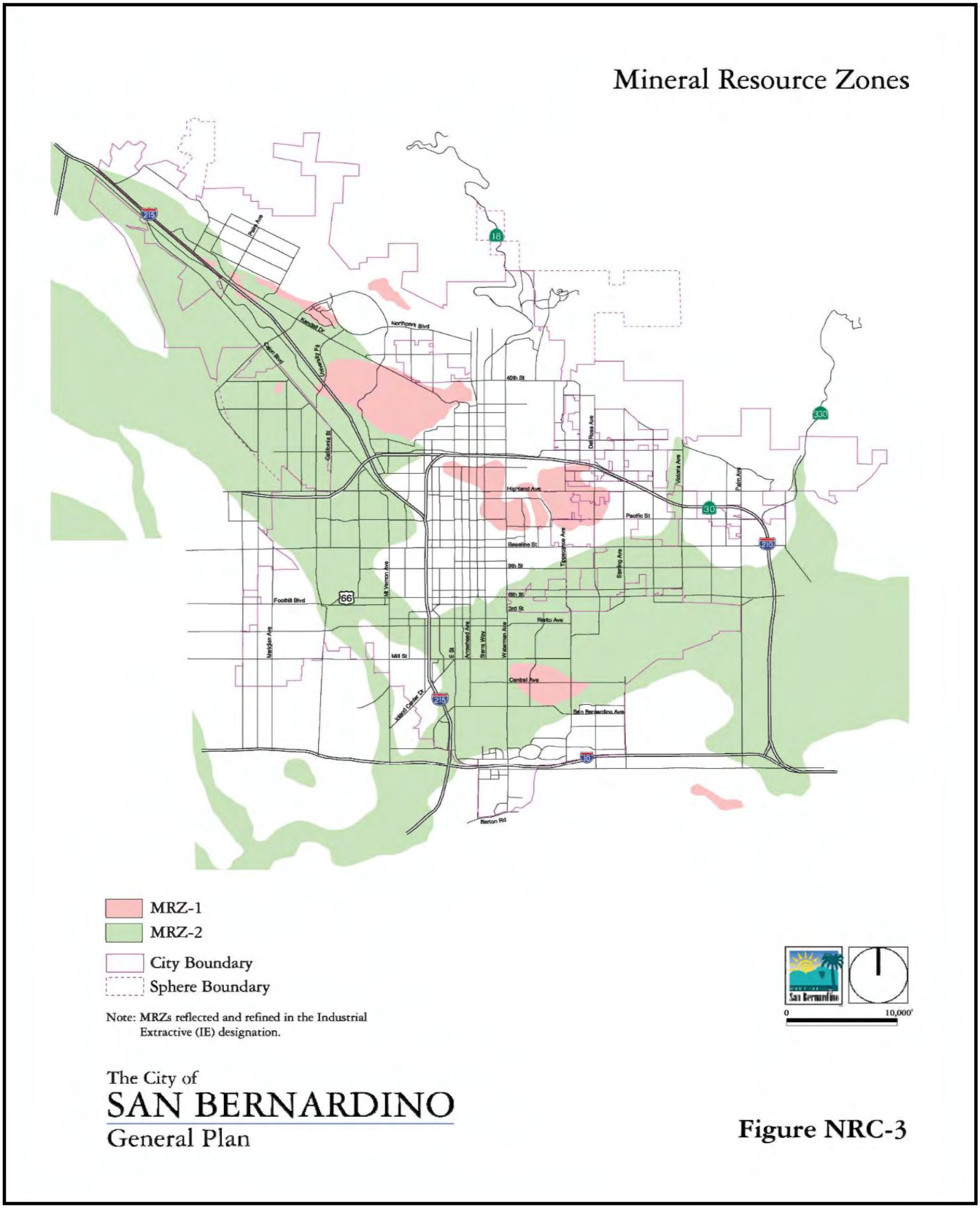

FIGURE XII-1

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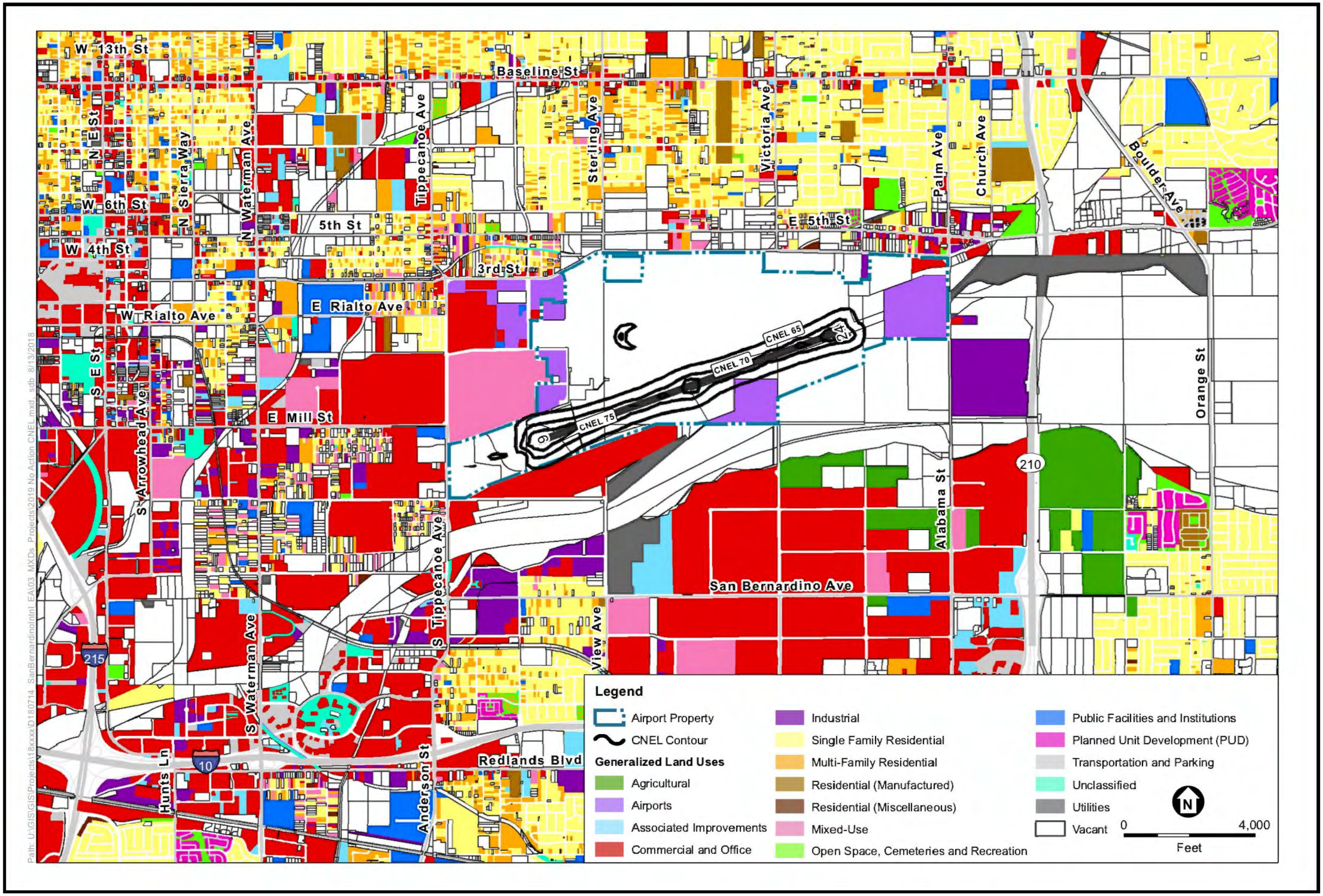
Environmental Consultants

Mineral Resource Zones

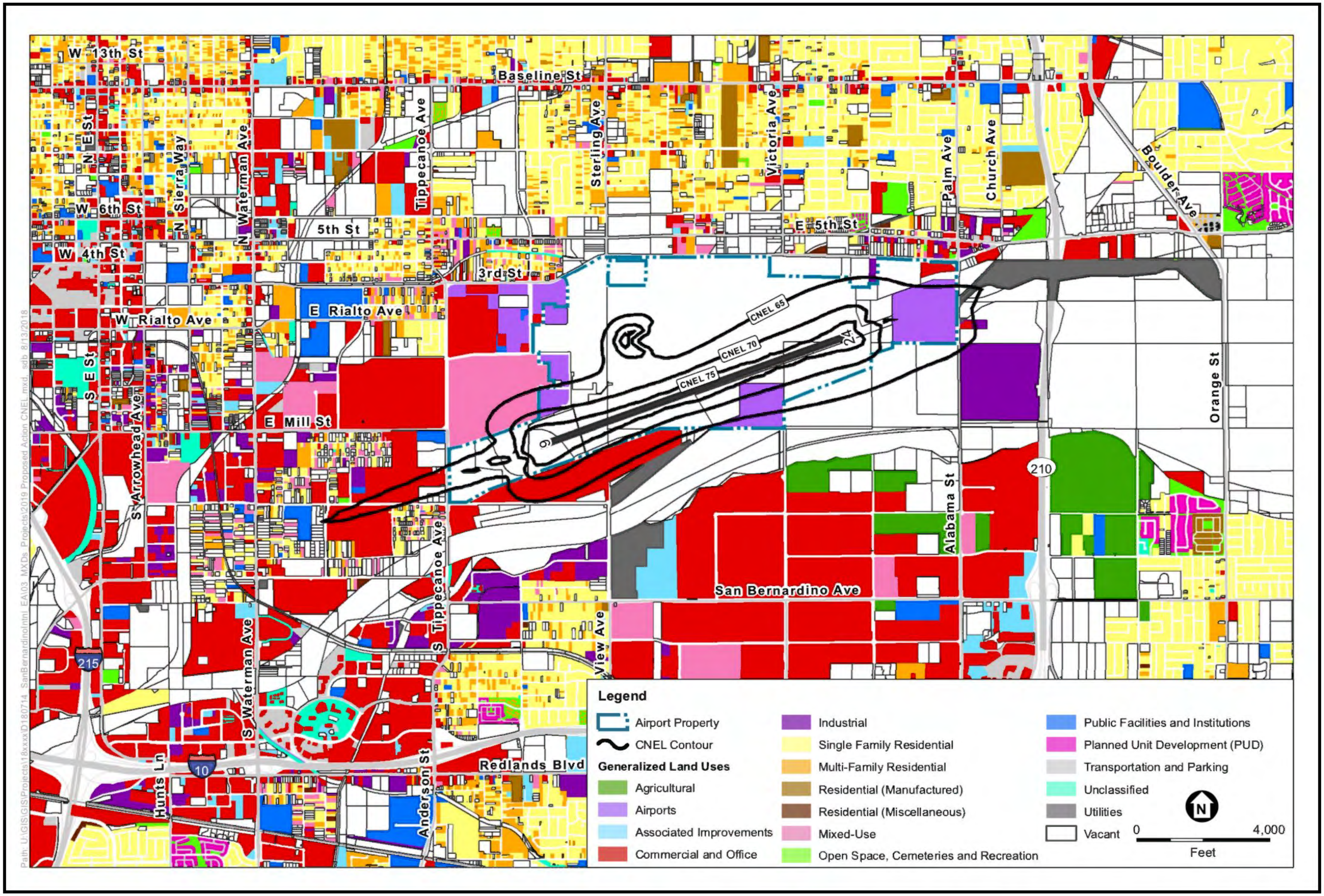


SOURCE: ESA

FIGURE XIII-1

Tom Dodson & Associates
Environmental Consultants

Noise Contours Airport Existing

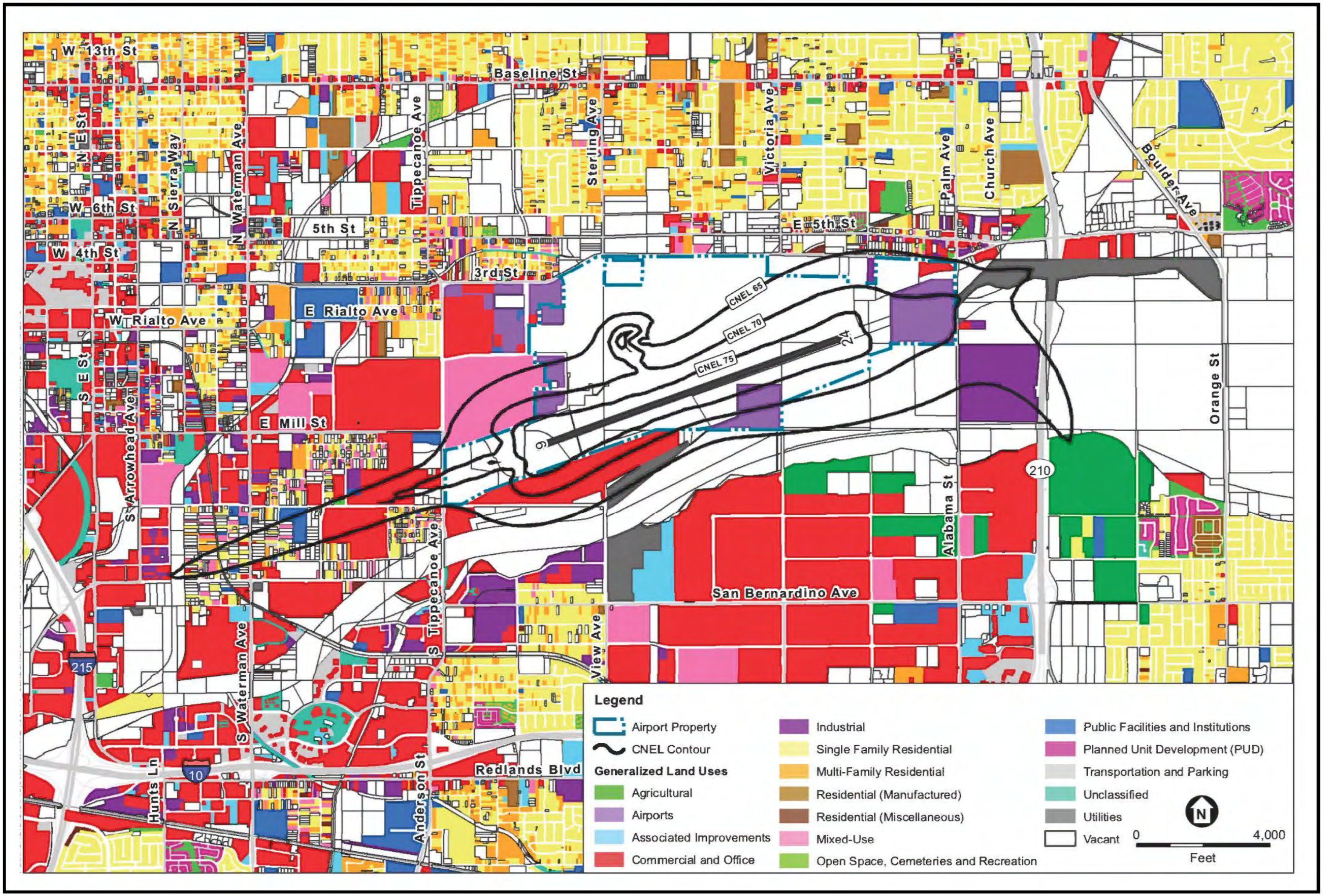


SOURCE: ESA

FIGURE XIII-2

Tom Dodson & Associates
Environmental Consultants

Noise Contours, 2019 Eastgate

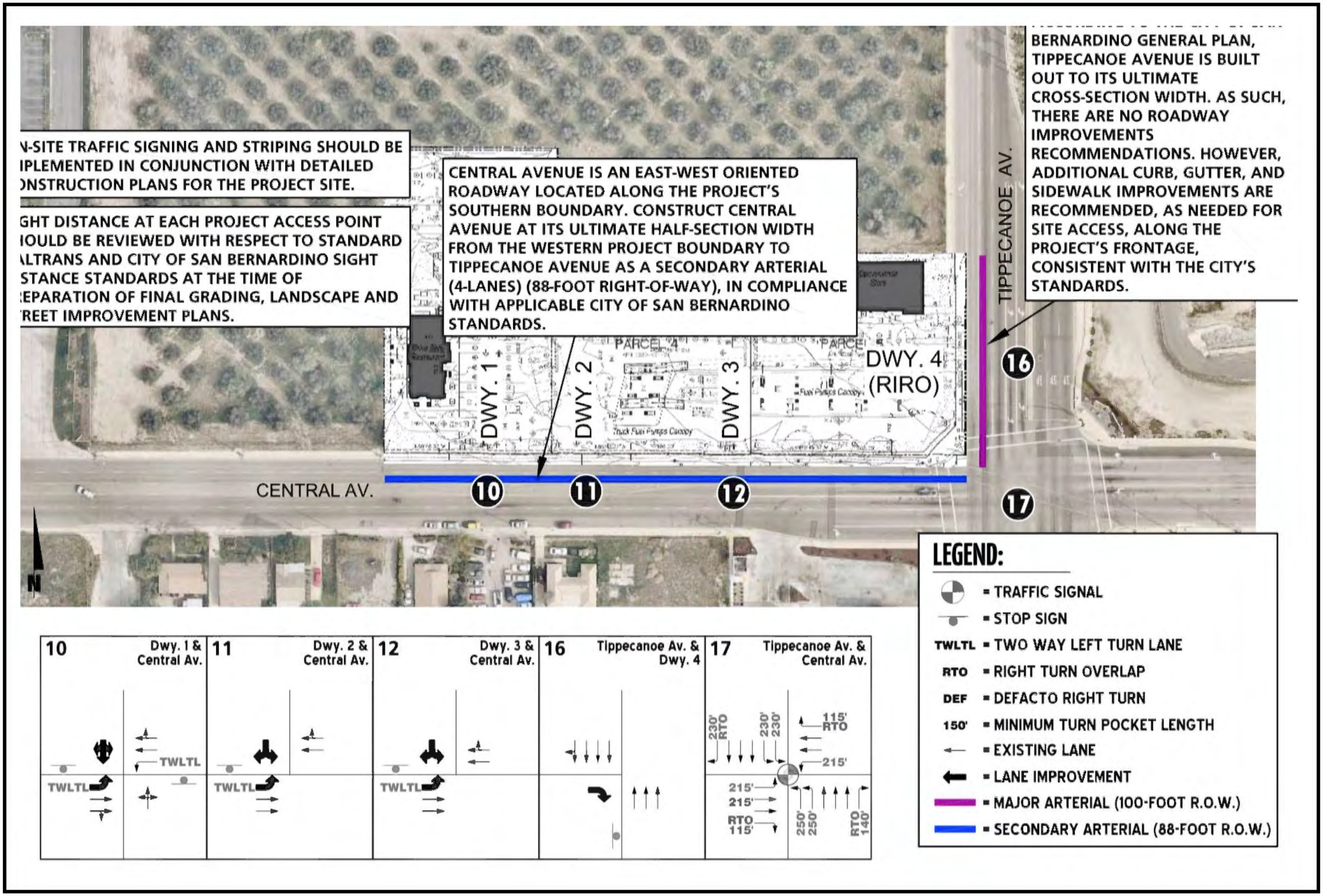


SOURCE: ESA

FIGURE XIII-3

Tom Dodson & Associates
Environmental Consultants

Noise Contours, 2024 Eastgate



SOURCE: Urban Crossroads

FIGURE XVII-1

Tom Dodson & Associates
Environmental Consultants

Site Adjacent Roadway and Site Access Recommendations

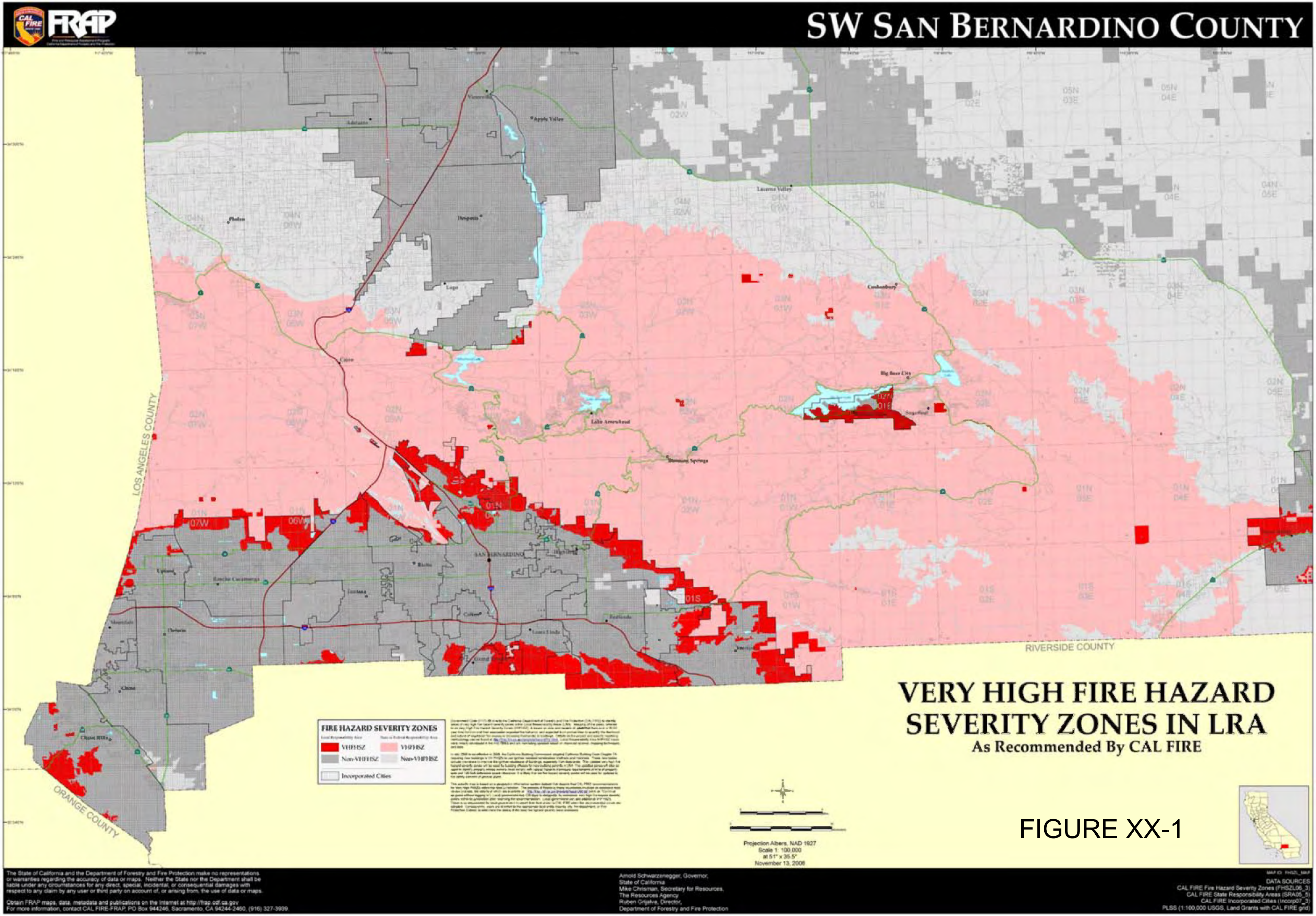
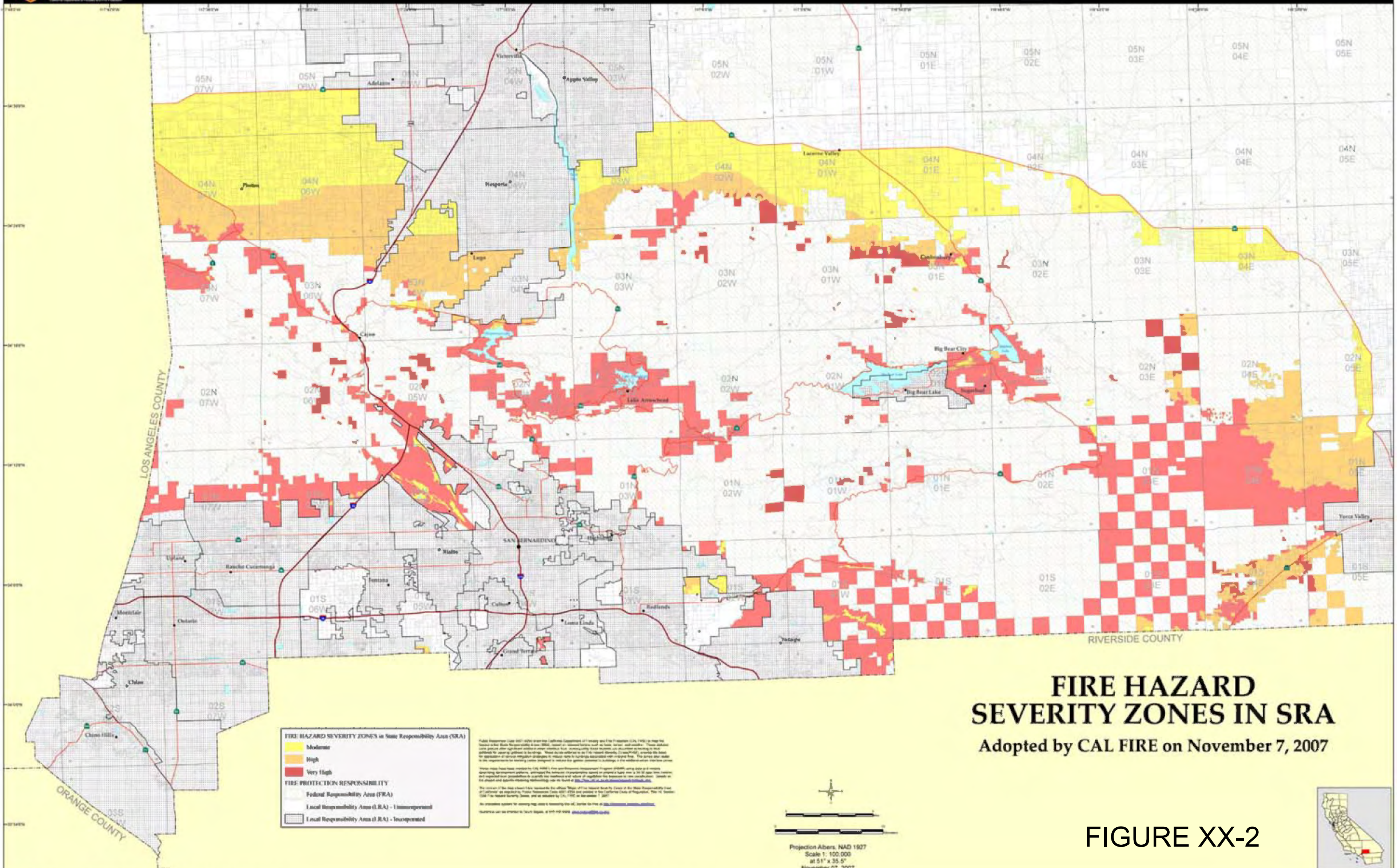

SW SAN BERNARDINO COUNTY
VERY HIGH FIRE HAZARD SEVERITY ZONES IN LRA
As Recommended By CAL FIRE
FIRE HAZARD SEVERITY ZONES
VHFHSZ
Non-VHFHSZ
VHFHSZ
Non-VHFHSZ
Incorporated Cities
LOS ANGELES COUNTY
ORANGE COUNTY
RIVERSIDE COUNTY
SAN BERNARDINO
Projection Albers, NAD 1927
Scale 1: 100,000
at 51" x 35.5"
November 13, 2008
The State of California and the Department of Forestry and Fire Protection make no representations or warranties regarding the accuracy of data or maps. Neither the State nor the Department shall be liable under any circumstances for any direct, special, incidental, or consequential damages with respect to any claim by any user or third party on account of, or arising from, the use of data or maps.
Obtain FRAP maps, data, metadata and publications on the Internet at http://frap.cdf.ca.gov
For more information, contact CAL FIRE-FRAP, PO Box 944246, Sacramento, CA 94244-2460, (916) 327-3939.
Arnold Schwarzenegger, Governor,
State of California
Mike Chrisman, Secretary for Resources,
The Resources Agency
Ruben Grijalva, Director,
Department of Forestry and Fire Protection
DATA SOURCES
CAL FIRE Fire Hazard Severity Zones (FHSZL06_3)
CAL FIRE State Responsibility Areas (SRA05_5)
CAL FIRE Incorporated Cities (Incorp07_3)
PLSS (1:100,000 USGS, Land Grants with CAL FIRE grid)

FIGURE XX-1



FIRE HAZARD SEVERITY ZONES IN SRA

Adopted by CAL FIRE on November 7, 2007

FIGURE XX-2

Arnold Schwarzenegger, Governor, State of California
Mike Chrisman, Secretary for Resources, The Resources Agency
Ruben Grijalva, Director, Department of Forestry and Fire Protection

MAP ID: FHSZS_MAP
DATA SOURCES
CAL FIRE Fire Hazard Severity Zones (FHSZS06_3)
CAL FIRE State Responsibility Areas (SRA05_5)
CAL FIRE Incorporated Cities (Incorp07_3)
PLSS (1:100,000 USGS, Land Grants with CAL FIRE grid)

APPENDIX 1

AIR QUALITY and GHG IMPACT ANALYSES

CE-280
CNG FUELING STATION PROJECT

CITY OF SAN BERNARDINO, CALIFORNIA

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Prepared for:

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PO Box 2307
San Bernardino, CA 92406-2307

Date:

November 1, 2021

Project No.: P21-023 AQ

BACKGROUND

The Project site is located on Central Avenue west of Tippecanoe Avenue and is currently vacant. The Project proposes operation of a Compressed Natural Gas (CNG) vehicle fueling station. At build out the Project will consist of time fill CNG posts for 215 trucks, as well as four (4) fast fill CNG dispenser fueling positions. The Project is anticipated to be completed by the year 2023 with construction commencing early 2022.

The site is approximately 6.4 acres in size. The refueling equipment compound encompasses approximately 72,270 square feet (sf, appx. 1.65 acres). The time-fill parking area and the vehicle parking area encompass approximately 204,882 sf (appx. 4.70 acres). Landscaping on the site encompasses approximately 36,859 sf (appx. 0.84 acre). Minimal above-ground structures will be installed.

The Facility will be available to authorized fleet customers 24 hours per day, 7 days per week. The Project will connect with an existing natural gas line located in Tippecanoe Avenue. The natural gas will be delivered to the site in an underground pipeline and compressed at the site. The Project is projected to dispense approximately 1.6 million Diesel Gallon Equivalent per year.

RENEWABLE NATURAL GAS (RNG)

RNG is produced by recycling organic waste materials at dairy farms, wastewater treatment plants, green waste plants, and landfills into a clean and affordable fuel. RNG is a drop-in replacement for conventional natural gas so that the existing pipeline transportation infrastructure is decarbonized.

According to CARB data, the RNG used in California in 2020 had an average carbon intensity (GHG score) that was negative. On the national level, RNG was 53% of the fuel used by natural gas vehicles in 2020.

For operational emissions, only non-carbon-based emissions will be presented. Since production of RNG fuel eliminates the escape of carbon-based emissions at their source any truck related emissions are assumed to be more than off-set by their initial elimination and are therefore considered less than significant.

CLIMATE AND METEOROLOGY

REGIONAL CLIMATE

The climate the eastern San Bernardino Valley, as with all of Southern California, is governed largely by the strength and location of the semi-permanent high pressure center over the Pacific Ocean and the moderating effects of the nearby vast oceanic heat reservoir. Local climatic conditions are characterized by very warm summers, mild winters, infrequent rainfall, moderate daytime on-shore breezes, and comfortable humidity levels. Unfortunately, the same climatic conditions that create such a desirable living climate combine to severely restrict the ability of the local atmosphere to disperse the large volumes of air pollution generated by the population and industry attracted in part by the climate.

The project will be situated in an area where the pollutants generated in coastal portions of the Los Angeles basin undergo photochemical reactions and then move inland across the project site during the daily sea breeze cycle. The resulting smog at times gives San Bernardino County some of the worst air quality in all of California. Fortunately, significant air quality improvement in the last decade suggests that healthful air quality may someday be attained despite the limited regional meteorological dispersion potential.

Winds across the project area are an important meteorological parameter because they control both the initial rate of dilution of locally generated air pollutant emissions as well as controlling their regional trajectory. Winds across the project site display a very unidirectional onshore flow from the southwest-west that is strongest in summer with a weaker offshore return flow from the northeast that is strongest on winter nights when the land is colder than the ocean. The onshore winds during the day average 6-8 mph while the offshore flow is often calm or drifts slowly westward at 1-3 mph.

During the daytime, any locally generated air emissions are thus rapidly transported eastward toward Banning Pass without generating any localized air quality impacts. The nocturnal drainage winds which move slowly across the area have some potential for localized stagnation, but fortunately, these winds have their origin in the adjacent mountains where background pollution levels are low such that any localized contributions do not create any unhealthful impacts.

In conjunction with the two characteristic wind regimes that affect the rate and orientation of horizontal pollutant transport, there are two similarly distinct types of temperature inversions that control the vertical depth through which pollutants are mixed. The summer on-shore flow is capped by a massive dome of warm, sinking air which caps a shallow layer of cooler ocean air. These marine/subsidence inversions act like a giant lid over the basin. They allow for local mixing of emissions, but they confine the entire polluted air mass within the basin until it escapes into the desert or along the thermal chimneys formed along heated mountain slopes.

In winter, when the air near the ground cools while the air aloft remains warm, radiation inversions are formed that trap low-level emissions such as automobile exhaust near their source. As background levels of primary vehicular exhaust rise during the seaward return flow, the combination of rising non-local baseline levels plus emissions trapped locally by these radiation inversions creates micro-scale air pollution "hot spots" near freeways, shopping centers and other traffic concentrations in coastal areas of the Los Angeles Basin. Because the nocturnal airflow down the adjacent slopes to the north has its origin in very lightly developed areas of the San Bernardino Mountains, background pollution levels at night in winter are very low in the project vicinity. Localized air pollution contributions are insufficient to create a "hot spot" potential when superimposed upon the clean nocturnal baseline. The combination of winds and inversions are thus critical determinants in leading to the degraded air quality in summer, and the generally good air quality in winter in the project area.

AIR QUALITY SETTING

AMBIENT AIR QUALITY STANDARDS (AAQS)

In order to gauge the significance of the air quality impacts of the proposed project, those impacts, together with existing background air quality levels, must be compared to the applicable ambient air quality standards. These standards are the levels of air quality considered safe, with an adequate margin of safety, to protect the public health and welfare. They are designed to protect those people most susceptible to further respiratory distress such as asthmatics, the elderly, very young children, people already weakened by other disease or illness, and persons engaged in strenuous work or exercise, called "sensitive receptors." Healthy adults can tolerate occasional exposure to air pollutant concentrations considerably above these minimum standards before adverse effects are observed. Recent research has shown, however, that chronic exposure to ozone (the primary ingredient in photochemical smog) may lead to adverse respiratory health even at concentrations close to the ambient standard.

National AAQS were established in 1971 for six pollution species with states retaining the option to add other pollutants, require more stringent compliance, or to include different exposure periods. The initial attainment deadline of 1977 was extended several times in air quality problem areas like Southern California. In 2003, the Environmental Protection Agency (EPA) adopted a rule, which extended and established a new attainment deadline for ozone for the year 2021. Because the State of California had established AAQS several years before the federal action and because of unique air quality problems introduced by the restrictive dispersion meteorology, there is considerable difference between state and national clean air standards. Those standards currently in effect in California are shown in Table 1. Sources and health effects of various pollutants are shown in Table 2.

The Federal Clean Air Act Amendments (CAAA) of 1990 required that the U.S. Environmental Protection Agency (EPA) review all national AAQS in light of currently known health effects. EPA was charged with modifying existing standards or promulgating new ones where appropriate. EPA subsequently developed standards for chronic ozone exposure (8+ hours per day) and for very small diameter particulate matter (called "PM-2.5"). New national AAQS were adopted in 1997 for these pollutants.

Planning and enforcement of the federal standards for PM-2.5 and for ozone (8-hour) were challenged by trucking and manufacturing organizations. In a unanimous decision, the U.S. Supreme Court ruled that EPA did not require specific congressional authorization to adopt national clean air standards. The Court also ruled that health-based standards did not require preparation of a cost-benefit analysis. The Court did find, however, that there was some inconsistency between existing and "new" standards in their required attainment schedules. Such attainment-planning schedule inconsistencies centered mainly on the 8-hour ozone standard. EPA subsequently agreed to downgrade the attainment designation for many communities to “non-attainment” for the 8-hour ozone standard.

Table 1

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[1]		National Standards[2]		
		Concentration[3]	Method[4]	Primary[3,5]	Secondary[3,6]	Method[7]
Ozone (O_3)[8]	1 Hour	0.09 ppm (180 $\mu g/m^3$)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 $\mu g/m^3$)		0.070 ppm (137 $\mu g/m^3$)		
Respirable Particulate Matter (PM10)[9]	24 Hour	50 $\mu g/m^3$	Gravimetric or Beta Attenuation	150 $\mu g/m^3$	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 $\mu g/m^3$		—		
Fine Particulate Matter (PM2.5)[9]	24 Hour	—	—	35 $\mu g/m^3$	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 $\mu g/m^3$	Gravimetric or Beta Attenuation	12.0 $\mu g/m^3$	15 $\mu g/m^3$	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m^3)	—	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)	—	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	
Nitrogen Dioxide (NO_2)[10]	1 Hour	0.18 ppm (339 $\mu g/m^3$)	Gas Phase Chemiluminescence	100 ppb (188 $\mu g/m^3$)	—	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 $\mu g/m^3$)		0.053 ppm (100 $\mu g/m^3$)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[11]	1 Hour	0.25 ppm (655 $\mu g/m^3$)	Ultraviolet Fluorescence	75 ppb (196 $\mu g/m^3$)	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)
	3 Hour	—		—	0.5 ppm (1300 $\mu g/m^3$)	
	24 Hour	0.04 ppm (105 $\mu g/m^3$)		0.14 ppm (for certain areas)[11]	—	
	Annual Arithmetic Mean	—		0.030 ppm (for certain areas)[11]	—	
Lead[12,13]	30 Day Average	1.5 $\mu g/m^3$	Atomic Absorption	—	—	High Volume Sampler and Atomic Absorption
	Calendar Quarter	—		1.5 $\mu g/m^3$ (for certain areas)[12]	Same as Primary Standard	
	Rolling 3-Month Average	—		0.15 $\mu g/m^3$		
Visibility Reducing Particles[14]	8 Hour	See footnote 14	Beta Attenuation and Transmittance through Filter Tape	No National Standards		
Sulfates	24 Hour	25 $\mu g/m^3$	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 $\mu g/m^3$)	Ultraviolet Fluorescence			
Vinyl Chloride[12]	24 Hour	0.01 ppm (26 $\mu g/m^3$)	Gas Chromatography			

See footnotes on next page ...

For more information please call ARB-PIO at (916) 322-2990

California Air Resources Board (5/4/16)

Table 1 (continued)

1. California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, and particulate matter (PM10, PM2.5, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2. National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the U.S. EPA for further clarification and current national policies.

3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4. Any equivalent measurement method which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

7. Reference method as described by the U.S. EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the U.S. EPA.

8. On October 1, 2015, the national 8-hour ozone primary and secondary standards were lowered from 0.075 to 0.070 ppm.

9. On December 14, 2012, the national annual PM2.5 primary standard was lowered from 15 $\mu g/m^3$ to 12.0 $\mu g/m^3$. The existing national 24-hour PM2.5 standards (primary and secondary) were retained at 35 $\mu g/m^3$, as was the annual secondary standard of 15 $\mu g/m^3$. The existing 24-hour PM10 standards (primary and secondary) of 150 $\mu g/m^3$ also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.

10. To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national 1-hour standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national 1-hour standard to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

11. On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

    Note that the 1-hour national standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the 1-hour national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

12. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

13. The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

14. In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

For more information please call ARB-PIO at (916) 322-2990 **California Air Resources Board (5/4/16)**

Table 2
Health Effects of Major Criteria Pollutants

Pollutants	Sources	Primary Effects
Carbon Monoxide (CO)	• Incomplete combustion of fuels and other carbon-containing substances, such as motor exhaust. • Natural events, such as decomposition of organic matter.	• Reduced tolerance for exercise. • Impairment of mental function. • Impairment of fetal development. • Death at high levels of exposure. • Aggravation of some heart diseases (angina).
Nitrogen Dioxide (NO_2)	• Motor vehicle exhaust. • High temperature stationary combustion. • Atmospheric reactions.	• Aggravation of respiratory illness. • Reduced visibility. • Reduced plant growth. • Formation of acid rain.
Ozone (O_3)	• Atmospheric reaction of organic gases with nitrogen oxides in sunlight.	• Aggravation of respiratory and cardiovascular diseases. • Irritation of eyes. • Impairment of cardiopulmonary function. • Plant leaf injury.
Lead (Pb)	• Contaminated soil.	• Impairment of blood function and nerve construction. • Behavioral and hearing problems in children.
Respirable Particulate Matter (PM-10)	• Stationary combustion of solid fuels. • Construction activities. • Industrial processes. • Atmospheric chemical reactions.	• Reduced lung function. • Aggravation of the effects of gaseous pollutants. • Aggravation of respiratory and cardio respiratory diseases. • Increased cough and chest discomfort. • Soiling. • Reduced visibility.
Fine Particulate Matter (PM-2.5)	• Fuel combustion in motor vehicles, equipment, and industrial sources. • Residential and agricultural burning. • Industrial processes. • Also, formed from photochemical reactions of other pollutants, including NOx, sulfur oxides, and organics.	• Increases respiratory disease. • Lung damage. • Cancer and premature death. • Reduces visibility and results in surface soiling.
Sulfur Dioxide (SO_2)	• Combustion of sulfur-containing fossil fuels. • Smelting of sulfur-bearing metal ores. • Industrial processes.	• Aggravation of respiratory diseases (asthma, emphysema). • Reduced lung function. • Irritation of eyes. • Reduced visibility. • Plant injury. • Deterioration of metals, textiles, leather, finishes, coatings, etc.

Source: California Air Resources Board, 2002.

Evaluation of the most current data on the health effects of inhalation of fine particulate matter prompted the California Air Resources Board (ARB) to recommend adoption of the statewide PM-2.5 standard that is more stringent than the federal standard. This standard was adopted in 2002. The State PM-2.5 standard is more of a goal in that it does not have specific attainment planning requirements like a federal clean air standard, but only requires continued progress towards attainment.

Similarly, the ARB extensively evaluated health effects of ozone exposure. A new state standard for an 8-hour ozone exposure was adopted in 2005, which aligned with the exposure period for the federal 8-hour standard. The California 8-hour ozone standard of 0.07 ppm is more stringent than the federal 8-hour standard of 0.075 ppm. The state standard, however, does not have a specific attainment deadline. California air quality jurisdictions are required to make steady progress towards attaining state standards, but there are no hard deadlines or any consequences of non-attainment. During the same re-evaluation process, the ARB adopted an annual state standard for nitrogen dioxide (NO_2) that is more stringent than the corresponding federal standard, and strengthened the state one-hour NO_2 standard.

As part of EPA's 2002 consent decree on clean air standards, a further review of airborne particulate matter (PM) and human health was initiated. A substantial modification of federal clean air standards for PM was promulgated in 2006. Standards for PM-2.5 were strengthened, a new class of PM in the 2.5 to 10 micron size was created, some PM-10 standards were revoked, and a distinction between rural and urban air quality was adopted. In December
2012, the federal annual standard for PM-2.5 was reduced from 15 $\mu g/m^3$ to 12 $\mu g/m^3$ which matches the California AAQS. The severity of the basin's non-attainment status for PM-2.5 may be increased by this action and thus require accelerated planning for future PM-2.5 attainment.

In response to continuing evidence that ozone exposure at levels just meeting federal clean air standards is demonstrably unhealthful, EPA had proposed a further strengthening of the 8-hour standard. A new 8-hour ozone standard was adopted in 2015 after extensive analysis and public input. The adopted national 8-hour ozone standard is 0.07 ppm which matches the current California standard. It will require three years of ambient data collection, then 2 years of non-attainment findings and planning protocol adoption, then several years of plan development and approval. Final air quality plans for the new standard are likely to be adopted around 2022. Ultimate attainment of the new standard in ozone problem areas such as Southern California might be after 2025.

In 2010 a new federal one-hour primary standard for nitrogen dioxide (NO_2) was adopted. This standard is more stringent than the existing state standard. Based upon air quality monitoring data in the South Coast Air Basin, the California Air Resources Board has requested the EPA to designate the basin as being in attainment for this standard. The federal standard for sulfur dioxide (SO_2) was also recently revised. However, with minimal combustion of coal and mandatory use of low sulfur fuels in California, SO_2 is typically not a problem pollutant.

BASELINE AIR QUALITY

Existing and probable future levels of air quality in the project area can be best inferred from ambient air quality measurements conducted by the South Coast Air Quality Management District (SCAQMD) at its Central San Bernardino monitoring station. This station measures both regional pollution levels such as dust (particulates) and smog, as well as levels of primary vehicular pollutants such as carbon monoxide. Table 3 summarizes the last four years of the published data from the Central San Bernardino monitoring station.

Ozone and particulates are seen to be the two most significant air quality concerns. Ozone is the primary ingredient in photochemical smog. Slightly more than 20 percent of all days exceed the California one-hour standard. The 8-hour state ozone standard has been exceeded an average of 30 percent of all days in the past four years. The federal 8-hour standard is exceeded 23 percent of all days. For the last four years, ozone levels have neither improved nor gotten noticeably worse. While ozone levels are still high, they are much lower than 10 to 20 years ago. Attainment of all clean air standards in the project vicinity is not likely to occur soon, but the severity and frequency of violations is expected to continue to slowly decline during the current decade.

In addition to gaseous air pollution concerns, San Bernardino experiences frequent violations of standards for 10-micron diameter respirable particulate matter (PM-10). High dust levels occur during Santa Ana wind conditions, as well as from the trapped accumulation of soot, roadway dust and byproducts of atmospheric chemical reactions during warm season days with poor visibility. Table 3 shows that almost 14 percent of all days in the last four years experienced a violation of the State PM-10 standard. However, the three-times less stringent federal standard has not been exceeded in the same time period.

A substantial fraction of PM-10 is comprised of ultra-small diameter particulates capable of being inhaled into deep lung tissue (PM-2.5). Peak annual PM-2.5 levels are sometimes almost as high as PM-10, which includes PM-2.5 as a sub-set. However, only one of all measurement days experienced a violation of the 24-hour standard of 35 $\mu g/m^3$ in the last four years.

While many of the major ozone precursor emissions (automobiles, solvents, paints, etc.) have been substantially reduced, most major PM-10 sources (construction dust, vehicular turbulence along roadway shoulders, truck exhaust, etc.) have not been as effectively reduced. Prospects of ultimate attainment of ozone standards are better than for particulate matter.

More localized pollutants such as carbon monoxide, nitrogen oxides, etc. are very low near the project site because background levels, never approach allowable levels. There is substantial excess dispersive capacity to accommodate localized vehicular air pollutants such as NOx or CO without any threat of violating applicable AAQS.

Table 3
Air Quality Monitoring Summary (2017-2020)
(Estimated Number of Days Standards Were Exceeded)

Pollutant/Standard	**2017**	**2018**	**2019**	**2020**
Ozone				
1-Hour > 0.09 ppm (S)	81	63	63	89
8-Hour > 0.07 ppm (S)	112	102	96	128
8- Hour > 0.075 ppm (F)	88	71	73	110
Max. 1-Hour Conc. (ppm)	0.158	0.138	0.127	0.162
Max. 8-Hour Conc. (ppm)	0.136	0.116	0.114	0.128
Carbon Monoxide				
8- Hour > 9. ppm (S,F)	0	0	0	0
Max 8-hour Conc. (ppm)	2.3	2.5	1.1	1.4
Nitrogen Dioxide				
1-Hour > 0.18 ppm (S)	0	0	0	0
Max. 1-Hour Conc. (ppm)	0.065	0.057	0.059	0.054
Respirable Particulates (PM-10)				
24-Hour > 50 μg/m^3 (S)	35/356	25/355	36/269	81/320
24-Hour > 150 μg/m^3 (F)	0/356	0/335	0/269	0/320
Max. 24-Hr. Conc. (μg/m^3)	86.	129.	112.	80.
Fine Particulates (PM-2.5)				
24-Hour > 35 μg/m^3 (F)	1/116	0/114	0/97	0/115
Max. 24-Hr. Conc. (μg/m^3)	38.2	30.1	34.8	25.7

S=State Standard
F=Federal Standard

Source: Central San Bernardino SCAQMD Air Monitoring Summary (5203)
data: www.arb.ca.gov/adam/

AIR QUALITY PLANNING

The Federal Clean Air Act (1977 Amendments) required that designated agencies in any area of the nation not meeting national clean air standards must prepare a plan demonstrating the steps that would bring the area into compliance with all national standards. The SCAB could not meet the deadlines for ozone, nitrogen dioxide, carbon monoxide, or PM-10. In the SCAB, the agencies designated by the governor to develop regional air quality plans are the SCAQMD and the Southern California Association of Governments (SCAG). The two agencies first adopted an Air Quality Management Plan (AQMP) in 1979 and revised it several times as earlier attainment forecasts were shown to be overly optimistic.

The 1990 Federal Clean Air Act Amendment (CAAA) required that all states with air-sheds with “serious” or worse ozone problems submit a revision to the State Implementation Plan (SIP). Amendments to the SIP have been proposed, revised and approved over the past decade. The most current regional attainment emissions forecast for ozone precursors (ROG and NOx) and for carbon monoxide (CO) and for particulate matter are shown in Table 4. Substantial reductions in emissions of ROG, NOx and CO are forecast to continue throughout the next several decades. Unless new particulate control programs are implemented, PM-10 and PM-2.5 are forecast to slightly increase.

The Air Quality Management District (AQMD) adopted an updated clean air “blueprint” in August 2003. The 2003 Air Quality Management Plan (AQMP) was approved by the EPA in 2004. The AQMP outlined the air pollution measures needed to meet federal health-based standards for ozone by 2010 and for particulates (PM-10) by 2006. The 2003 AQMP was based upon the federal one-hour ozone standard which was revoked late in 2005 and replaced by an 8-hour federal standard. Because of the revocation of the hourly standard, a new air quality planning cycle was initiated.

With re-designation of the air basin as non-attainment for the 8-hour ozone standard, a new attainment plan was developed. This plan shifted most of the one-hour ozone standard attainment strategies to the 8-hour standard. As previously noted, the attainment date was to “slip” from 2010 to 2021. The updated attainment plan also includes strategies for ultimately meeting the federal PM-2.5 standard.

Because Projected attainment by 2021 required control technologies that did not exist yet, the SCAQMD requested a voluntary “bump-up” from a “severe non-attainment” area to an “extreme non-attainment” designation for ozone. The extreme designation was to allow a longer time period for these technologies to develop. If attainment cannot be demonstrated within the specified deadline without relying on “black-box” measures, EPA would have been required to impose sanctions on the region had the bump-up request not been approved. In April 2010, the EPA approved the change in the non-attainment designation from “severe-17” to “extreme.” This reclassification set a later attainment deadline (2024), but also required the air basin to adopt even more stringent emissions controls.

Table 4
South Coast Air Basin Emissions Forecasts (Emissions in tons/day)

Pollutant	2015[a]	2025[b]	2030[b]
NOx	357	266	257
VOC	400	393	391
PM-10	161	170	172
PM-2.5	67	70	71

[a]2015 Base Year.
[b]With current emissions reduction programs and adopted growth forecasts.
Source:California Air Resources Board, 2013 Almanac of Air Quality

In other air quality attainment plan reviews, EPA had disapproved part of the SCAB PM-2.5 attainment plan included in the AQMP. EPA stated that the current attainment plan relied on PM-2.5 control regulations that had not yet been approved or implemented. It was expected that a number of rules that were pending approval would remove the identified deficiencies. If these issues were not resolved within the next several years, federal funding sanctions for transportation Projects could result. The 2012 AQMP included in the current California State Implementation Plan (SIP) was expected to remedy identified PM-2.5 planning deficiencies.

The federal Clean Air Act requires that non-attainment air basins have EPA approved attainment plans in place. This requirement includes the federal one-hour ozone standard even though that standard was revoked almost ten years ago. There was no approved attainment plan for the one-hour federal standard at the time of revocation. Through a legal quirk, the SCAQMD is now required to develop an AQMP for the long since revoked one-hour federal ozone standard. Because the current SIP for the basin contains a number of control measures for the 8-hour ozone standard that are equally effective for one-hour levels, the 2012 AQMP was believed to satisfy hourly attainment planning requirements.

AQMPs are required to be updated every three years. The 2012 AQMP was adopted in early 2013. An updated AQMP was required for completion in 2016. The 2016 AQMP was adopted by the SCAQMD Board in March 2017 and has been submitted the California Air Resources Board for forwarding to the EPA. The 2016 AQMP acknowledges that motor vehicle emissions have been effectively controlled and that reductions in NOx, the continuing ozone problem pollutant, may need to come from major stationary sources (power plants, refineries, landfill flares, etc.). The current attainment deadlines for all federal non-attainment pollutants are now as follows:

8-hour ozone (70 ppb)	2032
Annual PM-2.5 (12 $\mu g/m^3$)	2025
8-hour ozone (75 ppb)	2024 (old standard)
1-hour ozone (120 ppb)	2023 (rescinded standard)
24-hour PM-2.5 (35 $\mu g/m^3$)	2019

The key challenge is that NOx emission levels, as a critical ozone precursor pollutant, are forecast to continue to exceed the levels that would allow the above deadlines to be met. Unless additional stringent NOx control measures are adopted and implemented, ozone attainment goals may not be met.

The proposed Project does not directly relate to the AQMP in that there are no specific air quality programs or regulations governing fuel dispensing Projects. Conformity with adopted plans, forecasts and programs relative to population, housing, employment and land use is the primary yardstick by which impact significance of planned growth is determined. The SCAQMD, however, while acknowledging that the AQMP is a growth-accommodating document, does not favor designating regional impacts as less-than-significant just because the proposed development is consistent with regional growth Projections. Air quality impact significance for the proposed Project has therefore been analyzed on a Project-specific basis.

AIR QUALITY IMPACT

STANDARDS OF SIGNIFICANCE

Standards of Significance

Air quality impacts are considered "significant" if they cause clean air standards to be violated where they are currently met, or if they "substantially" contribute to an existing violation of standards. Any substantial emissions of air contaminants for which there is no safe exposure, or nuisance emissions such as dust or odors, would also be considered a significant impact.

Appendix G of the California CEQA Guidelines offers the following four tests of air quality impact significance. A Project would have a potentially significant impact if it:

a) Conflicts with or obstructs implementation of the applicable air quality plan.

b) Results in a cumulatively considerable net increase of any criteria pollutants for which the Project region is non-attainment under an applicable federal or state ambient air quality standard.

c) Exposes sensitive receptors to substantial pollutant concentrations.

d) Creates objectionable odors affecting a substantial number of people.

Primary Pollutants

Air quality impacts generally occur on two scales of motion. Near an individual source of emissions or a collection of sources such as a crowded intersection or parking lot, levels of those pollutants that are emitted in their already unhealthful form will be highest. Carbon monoxide (CO) is an example of such a pollutant. Primary pollutant impacts can generally be evaluated directly in comparison to appropriate clean air standards. Violations of these standards where they are currently met, or a measurable worsening of an existing or future violation, would be considered a significant impact. Many particulates, especially fugitive dust emissions, are also primary pollutants. Because of the non-attainment status of the South Coast Air Basin (SCAB) for PM-10, an aggressive dust control program is required to control fugitive dust during Project construction.

Secondary Pollutants

Many pollutants, however, require time to transform from a more benign form to a more unhealthful contaminant. Their impact occurs regionally far from the source. Their incremental regional impact is minute on an individual basis and cannot be quantified except through complex photochemical computer models. Analysis of significance of such emissions is based upon a specified number of emissions (pounds, tons, etc.) even though there is no way to translate those emissions directly into a corresponding ambient air quality impact.

Because of the chemical complexity of primary versus secondary pollutants, the SCAQMD has designated significant emissions levels as surrogates for evaluating regional air quality impact significance independent of chemical transformation processes. Projects with daily emissions that exceed any of the following emission thresholds are recommended by the SCAQMD to be considered significant under CEQA guidelines.

Table 5
Daily Emissions Thresholds

Pollutant	Construction	Operations
ROG	75	55
NOx	100	55
CO	550	550
PM-10	150	150
PM-2.5	55	55
SOx	150	150
Lead	3	3

Source: SCAQMD CEQA Air Quality Handbook, November, 1993 Rev.

CONSTRUCTION ACTIVITY IMPACTS

CalEEMod was developed by the SCAQMD to provide a model by which to calculate both construction emissions and operational emissions from a variety of land use projects. It calculates both the daily maximum and annual average emissions for criteria pollutants as well as total or annual greenhouse gas (GHG) emissions.

The project construction is designed to minimize earthwork activities by matching existing drainage patterns, with approximately 5,000 cy of import. The Project was modeled as starting first quarter 2022 and ending in the first quarter of 2023.

Estimated construction emissions were modeled using CalEEMod2020.4.0 to identify maximum daily emissions for each pollutant during project construction. Modeling reflected the construction schedule and equipment list as shown in Table 6.

Table 6
Construction Activity Equipment Fleet

Phase Name and Duration	Equipment
Grading (20 days)	1 Grader
	1 Dozer
	1 Excavator
	2 Crawling Tractors
	3 Loader/Backhoes
Construction (230 days)	1 Crane
	3 Loader/Backhoes
	1 Welder
	1 Generator Set
	3 Forklifts
Paving (20 days)	2 Pavers
	2 Paving Equipment
	2 Rollers

Utilizing this indicated equipment fleet and durations shown in Table 6 the following worst-case daily construction emissions are calculated by CalEEMod and are listed in Table 7.

Table 7
Construction Activity Emissions
Maximum Daily Emissions (pounds/day)

Maximal Construction Emissions	ROG	NOx	CO	SO_2	PM-10	PM-2.5
2022						
Unmitigated	3.0	36.4	21.3	0.1	9.3	4.9
Mitigated	3.0	36.4	21.3	0.1	4.9	2.8
2023						
Unmitigated	1.9	15.8	19.7	0.0	1.9	1.0
Mitigated	1.9	15.8	19.7	0.0	1.9	1.0
SCAQMD Thresholds	75	100	550	150	150	55

Peak daily construction activity emissions are estimated to be below SCAQMD CEQA thresholds without the need for added mitigation. The only model-based mitigation measured applied for this project was watering exposed dirt surfaces three times per day to minimize the generation of fugitive dust generation during grading.

Construction equipment exhaust contains carcinogenic compounds within the diesel exhaust particulates. The toxicity of diesel exhaust is evaluated relative to a 24-hour per day, 365 days per year, 70-year lifetime exposure. The SCAQMD does not generally require the analysis of construction-related diesel emissions relative to health risk due to the short period for which the majority of diesel exhaust would occur. Health risk analyses are typically assessed over a 9-, 30-, or 70-year timeframe and not over a relatively brief construction period due to the lack of health risk associated with such a brief exposure.

LOCALIZED SIGNIFICANCE THRESHOLDS

The SCAQMD has developed analysis parameters to evaluate ambient air quality on a local level in addition to the more regional emissions-based thresholds of significance. These analysis elements are called Localized Significance Thresholds (LSTs). LSTs were developed in response to Governing Board's Environmental Justice Enhancement Initiative 1-4 and the LST methodology was provisionally adopted in October 2003 and formally approved by SCAQMD's Mobile Source Committee in February 2005.

Use of an LST analysis for a project is optional. For the proposed project, the primary source of possible LST impact would be during construction. LSTs are applicable for a sensitive receptor where it is possible that an individual could remain for 24 hours such as a residence, hospital or convalescent facility.

LSTs are only applicable to the following criteria pollutants: oxides of nitrogen (NOx), carbon monoxide (CO), and particulate matter (PM-10 and PM-2.5). LSTs represent the maximum emissions from a project that are not expected to cause or contribute to an exceedance of the most stringent applicable federal or state ambient air quality standard, and are developed based on the ambient concentrations of that pollutant for each source receptor area and distance to the nearest sensitive receptor.

LST screening tables are available for 25, 50, 100, 200 and 500 meter source-receptor distances. For this project, since there is are residential uses just south of the site across E Central Avenue. The closest homes are approximately 110 feet from the closest site boundary and the most conservative 25-meter distance was modeled.

The SCAQMD has issued guidance on applying CalEEMod to LSTs. LST pollutant screening level concentration data is currently published for 1, 2 and 5 acre sites for varying distances. For this project, in accordance with SCAQMD guidelines[1], the screening thresholds for a 2-acre site were used.

The following thresholds and emissions in Table 8 are therefore determined (pounds per day):

Table 8
LST and Project Emissions (pounds/day)

LST Central San Bernardino Valley	CO	NOx	PM-10	PM-2.5
LST Threshold	972	170	7	4
Max On-Site Emissions				
2022Unmitigated	19	31	8	5
2022 Mitigated	19	31	4	3
2023 Unmitigated	16	14	1	1
2023 Mitigated	16	14	1	1

CalEEMod Output in Appendix
Only emissions occurring at the site, not from on-road travel as shown in Table 7

LSTs were compared to the maximum daily construction activities. As seen in Table 8, with active dust suppression, mitigated emissions meet the LST for construction thresholds. LST impacts are less-than-significant.

Therefore, the following construction mitigation measure is necessary to ensure LST thresholds are maintained below significance thresholds:

- Exposed surfaces will be watered at least three times per day during grading activities

OPERATIONAL IMPACTS

The project would be expected to generate approximately 1,597 daily trips using trip generation numbers provided in the Traffic Report prepared for this project. This number is in PCE equivalent where a truck is weighted a factor of 1.5 more than a passenger vehicle. Much of the site is timed fill posts, where a passenger car arrives to drive a time filled truck and then returns the truck and

[1] http://www.aqmd.gov/docs/default-source/ceqa/handbook/localized-significance-thresholds/caleemod-guidance.pdf

drives home. The 1,081 PCE time filled spots equate to 860 non PCE trips where half are trucks and half are passenger vehicles. These trucks in addition to the fast fill CNG spots total 880 trucks per day that will be fueling at the Project site.

Without knowing the mileage the trucks travel, it is difficult to determine truck emissions which are typically provided by the California Air Resources Board on a grams/mile basis. Therefore, the Project throughput of 1.6 million diesel gallons equivalent per year was used as a basis to determine total mileage.

Using total VMT (vehicle miles traveled) and gasoline consumption factors provided in the Emissions Factor Program EMFAC2021[2], the following mileage per gallon information was calculated averaging different types of trucks within the San Bernardino County region. As shown in Table 9, an average of about 6 miles per gallon was calculated for three types of heavy trucks. Although many of the trucks projected for use at the Project site will be smaller, less polluting vehicles with greater mileage per gallon, the trucks in Table 9 were used to represent a worst-case condition.

Table 9
Mileage per Truck Type and Fuel Type Year 2023

EMFAC Truck Designation	Description	MPG Diesel Gas	MPG Natural Gas	Fuel Type Difference
T7 SWCV	Heavy-Heavy Duty Diesel Solid Waste Collection Truck	6.11	6.00	2%
T7 POLA	Heavy-Heavy Duty Diesel Drayage Truck near South Coast	6.18	5.99	3%
T6 Public	Medium-Heavy Duty Diesel Public Fleet Truck	6.14	5.69	8%

The fuel efficiency of CNG-powered vehicles is slightly lower than diesel fueled trucks. However, despite the small difference in efficiency for ease of calculations, emissions for both the diesel trucks, and the natural gas trucks were both assumed to average 6 miles per gallon. With an annual throughput of 1.6 million gallons this would be the equivalent of 266,667 truck miles year or 731 daily miles.

Using EMFAC2021v1.0.1 emission rates, the following Project emissions are shown in Table 10. The comparison to diesel fueled vehicles is for information only. The Project will utilize RNG sources and as stated earlier in this report, only non-carbon based emissions are analyzed.

[2] https://arb.ca.gov/emfac/emissions-inventory/a2ea2ceaee41c3b3ee08fb4f5c40c42f5263d079

Table 10
2023 T7 POLA Truck Daily Emissions (lbs/day)

Emission Source	ROG	NOx	SO_2	PM-10	PM-2.5
Diesel Gas	6.6	80.8	0.2	0.1	0.1
Natural Gas*	1.7	43.0	0.0	0.1	0.1
SCAQMD Threshold	55	55	150	150	55

*using ICE

As shown natural gas vehicles emit much less pollutants than their diesel counterparts. Even if all project trucks were heavy duty, daily emissions would not exceed their SCAQMD operational thresholds.

GASOLINE DISPENSING EMISSIONS AND HEALTH RISK

Gasoline stations are subject to and required to comply with SCAQMD Rules 461 (Gasoline Transfer and Dispensing) as well as a Permit to Construct and Permit to Operate, Rules 201 and 203, respectively[3]. These required permits identify a maximum annual throughput allowed based on specific fuel storage and dispensing equipment that is proposed by the operator. However, these rules are applicable to gasoline dispensing, not natural gas. Emissions primarily pertain to VOC/ROG which is not a concern with natural gas.

[3] http://www.aqmd.gov/home/rules-compliance/compliance/gasoline-dispensing2

CONSTRUCTION EMISSIONS MINIMIZATION

Construction activities are not anticipated to cause dust emissions to exceed SCAQMD CEQA thresholds. Nevertheless, emissions minimization through enhanced dust control measures is recommended for use because of the non-attainment status of the air basin. Recommended measures include:

Fugitive Dust Control

- Apply soil stabilizers or moisten inactive areas.
- Water exposed surfaces as needed to avoid visible dust leaving the construction site (typically 2-3 times/day).
- Cover all stock piles with tarps at the end of each day or as needed.
- Provide water spray during loading and unloading of earthen materials.
- Minimize in-out traffic from construction zone
- Cover all trucks hauling dirt, sand, or loose material and require all trucks to maintain at least two feet of freeboard
- Sweep streets daily if visible soil material is carried out from the construction site

Similarly, ozone precursor emissions (ROG and NOx) are calculated to be below SCAQMD CEQA thresholds. However, because of the regional non-attainment for photochemical smog, the use of reasonably available control measures for diesel exhaust is recommended. Combustion emissions control options include:

Exhaust Emissions Control

- Utilize well-tuned off-road construction equipment.
- Establish a preference for contractors using Tier 3 or better rated heavy equipment.
- Enforce 5-minute idling limits for both on-road trucks and off-road equipment.

GREENHOUSE GAS EMISSIONS

"Greenhouse gases" (so called because of their role in trapping heat near the surface of the earth) emitted by human activity are implicated in global climate change, commonly referred to as "global warming." These greenhouse gases contribute to an increase in the temperature of the earth's atmosphere by transparency to short wavelength visible sunlight, but near opacity to outgoing terrestrial long wavelength heat radiation in some parts of the infrared spectrum. The principal greenhouse gases (GHGs) are carbon dioxide, methane, nitrous oxide, ozone, and water vapor. For purposes of planning and regulation, Section 15364.5 of the California Code of Regulations defines GHGs to include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride. Fossil fuel consumption in the transportation sector (on-road motor vehicles, off-highway mobile sources, and aircraft) is the single largest source of GHG emissions, accounting for approximately half of GHG emissions globally. Industrial and commercial sources are the second largest contributors of GHG emissions with about one-fourth of total emissions.

California has passed several bills and the Governor has signed at least three executive orders regarding greenhouse gases. GHG statues and executive orders (EO) include AB 32, SB 1368, EO S-03-05, EO S-20-06 and EO S-01-07.

AB 32 is one of the most significant pieces of environmental legislation that California has adopted. Among other things, it is designed to maintain California's reputation as a "national and international leader on energy conservation and environmental stewardship." It will have wide-ranging effects on California businesses and lifestyles as well as far reaching effects on other states and countries. A unique aspect of AB 32, beyond its broad and wide-ranging mandatory provisions and dramatic GHG reductions are the short time frames within which it must be implemented. Major components of the AB 32 include:

- Require the monitoring and reporting of GHG emissions beginning with sources or categories of sources that contribute the most to statewide emissions.
- Requires immediate "early action" control programs on the most readily controlled GHG sources.
- Mandates that by 2020, California's GHG emissions be reduced to 1990 levels.
- Forces an overall reduction of GHG gases in California by 25-40%, from business as usual, to be achieved by 2020.
- Must complement efforts to achieve and maintain federal and state ambient air quality standards and to reduce toxic air contaminants.

Statewide, the framework for developing the implementing regulations for AB 32 is under way. Maximum GHG reductions are expected to derive from increased vehicle fuel efficiency, from greater use of renewable energy and from increased structural energy efficiency. Additionally, through the California Climate Action Registry (CCAR now called the Climate Action Reserve), general and industry-specific protocols for assessing and reporting GHG emissions have been developed. GHG sources are categorized into direct sources (i.e. company owned) and indirect sources (i.e. not company owned). Direct sources include combustion emissions from on-and off-road mobile sources, and fugitive emissions. Indirect sources include off-site electricity generation and non-company owned mobile sources.

THRESHOLDS OF SIGNIFICANCE

In response to the requirements of SB97, the State Resources Agency developed guidelines for the treatment of GHG emissions under CEQA. These new guidelines became state laws as part of Title 14 of the California Code of Regulations in March, 2010. The CEQA Appendix G guidelines were modified to include GHG as a required analysis element. A project would have a potentially significant impact if it:

- Generates GHG emissions, directly or indirectly, that may have a significant impact on the environment, or,

- Conflicts with an applicable plan, policy or regulation adopted to reduce GHG emissions.

Section 15064.4 of the Code specifies how significance of GHG emissions is to be evaluated. The process is broken down into quantification of project-related GHG emissions, making a determination of significance, and specification of any appropriate mitigation if impacts are found to be potentially significant. At each of these steps, the new GHG guidelines afford the lead agency with substantial flexibility.

Emissions identification may be quantitative, qualitative or based on performance standards. CEQA guidelines allow the lead agency to "select the model or methodology it considers most appropriate." The most common practice for transportation/combustion GHG emissions quantification is to use a computer model such as CalEEMod, as was used in the ensuing analysis.

The significance of those emissions then must be evaluated; the selection of a threshold of significance must take into consideration what level of GHG emissions would be cumulatively considerable. The guidelines are clear that they do not support a zero net emissions threshold. If the lead agency does not have sufficient expertise in evaluating GHG impacts, it may rely on thresholds adopted by an agency with greater expertise.

On December 5, 2008 the SCAQMD Governing Board adopted an Interim quantitative GHG Significance Threshold for industrial projects where the SCAQMD is the lead agency (e.g., stationary source permit projects, rules, plans, etc.) of 10,000 Metric Tons (MT) CO_2 equivalent/year. In September 2010, the SCAQMD CEQA Significance Thresholds GHG Working Group released revisions which recommended a threshold of 3,000 MT CO_2e for all land use projects. This 3,000 MT/year recommendation has been used as a guideline for this analysis. In the absence of an adopted numerical threshold of significance, project related GHG emissions in excess of the guideline level are presumed to trigger a requirement for enhanced GHG reduction at the project level.

PROJECT RELATED GHG EMISSIONS GENERATION

Construction Activity GHG Emissions

The project is assumed to require less than one year for construction. During project construction, the CalEEMod2020.4.0 computer model predicts that the construction activities will generate the annual CO_2e emissions identified in Table 10.

Table 10
Construction Emissions (Metric Tons CO_2e)

2022	436.7
2023	77.1
Total	513.8
Amoritized	**17.1**

CalEEMod Output provided in appendix

SCAQMD GHG emissions policy from construction activities is to amortize emissions over a 30-year lifetime. The amortized level is also provided. GHG impacts from construction are considered individually less-than-significant.

Project Operational GHG Emissions

The input assumptions for operational GHG emissions calculations, and the GHG conversion from consumption to annual regional CO_2e emissions are summarized in the CalEEMod2020.4.0 output files found in the appendix of this report. Only GHG emissions associated with the running of a gas station were analyzed. As discussed, GHG mobile emissions are assumed to be negative by virtue of being RNG sourced. With this, the total operational and annualized construction emissions for the proposed project are identified in Table 11. The project GHG emissions are considered less-than-significant.

Table 11
Operational Emissions
(Metric Tons CO_2e)

Consumption Source	
Area Sources	0.0
Energy Utilization	2.0
Mobile Source	na
Solid Waste Generation	1.1
Water Consumption	0.3
Construction	17.1
Total	**20.5**
Guideline Threshold	3,000

CONSISTENCY WITH GHG PLANS, PROGRAMS AND POLICIES

In March 2014, the San Bernardino Associated Governments and Participating San Bernardino County Cities Partnership (Partnership) created a final draft of the San Bernardino County Regional Greenhouse Gas Reduction Plan (Reduction Plan) for each of the 25 jurisdictional Partner Cities in the County. The plan was recently updated in March of 2021. The Reduction Plan was created in accordance with AB 32, which established a greenhouse gas limit for the state of California. The Reduction Plan seeks to create an inventory of GHG gases and develop jurisdiction specific GHG reduction measures and baseline information that could be used by the Partnership Cities of San Bernardino County, including the County itself.

Projects that demonstrate consistency with the strategies, actions, and emission reduction targets contained in the Reduction Plan would have a less than significant impact on climate change. The project will generate little GHG emissions as shown in Table 11. The only reduction measures applicable to this project are presented below. Therefore, consistency with the Reduction Plan would result in a less than significant impact with respect to GHG emissions.

- Encourage water-efficient landscaping practices.

- Establish a goal that a certain percentage of all water used for non-potable sources (such as landscaping irrigation) be recycled wastewater.

- Exceed the waste diversion goal recommended by Assembly Bill 939 and CalGreen.

The major source of emission typically associated with most Projects are mobile source related. Because the fuel origin for this project is RNG it is automatically associated as being air quality positive. The Project, as shown in Table 11, will account for a very low amount of area source, water, or waste GHG emissions. By providing a RNG fuel source for CNG based vehicles the project is considered to be GHG positive.

CALEEMOD2020.4.0 COMPUTER MODEL OUTPUT

- **DAILY EMISISONS**
- **ANNUAL EMISSIONS**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

Clean Energy Gas Station, San Bernardino

South Coast Air Basin, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Gasoline/Service Station	4.00	Pump	1.65	564.70	0
Other Asphalt Surfaces	204.88	1000sqft	4.70	204,882.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	10			**Operational Year**	2023
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	390.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - 6.4 acres total

Construction Phase -

Off-road Equipment - Grading: 1 excavator, 1 grader. 1 dozer, 3 loaderbackhoes, 2 tractors

Off-road Equipment - Construction: 1 crane, 3 forklifts, 1 gen set, 3 loader/backhoes, 1 welder

Off-road Equipment - Paving: 2 pavers, 2 paving equipment, 2 rollers

Grading - 5000 cy import

Vehicle Trips - construction emissions only

Construction Off-road Equipment Mitigation -

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

Table Name	Column Name	Default Value	New Value
tblGrading	AcresOfGrading	37.50	20.00
tblGrading	MaterialImported	0.00	5,000.00
tblLandUse	LotAcreage	0.01	1.65
tblOffRoadEquipment	LoadFactor	0.43	0.43
tblOffRoadEquipment	OffRoadEquipmentType		Crawler Tractors
tblVehicleTrips	ST_TR	182.17	0.00
tblVehicleTrips	SU_TR	166.88	0.00
tblVehicleTrips	WD_TR	172.01	0.00

2.0 Emissions Summary

Clean Energy Gas Station, San Bernardino - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	3.0119	36.4112	21.2643	0.0644	7.8808	1.3779	9.2587	3.6381	1.2691	4.9072	0.0000	6,499.587 5	6,499.587 5	1.4868	0.3384	6,637.599 8
2023	1.8812	15.8123	19.7201	0.0415	1.1790	0.7120	1.8910	0.3176	0.6700	0.9876	0.0000	4,073.478 8	4,073.478 8	0.7176	0.1163	4,124.469 1
Maximum	**3.0119**	**36.4112**	**21.2643**	**0.0644**	**7.8808**	**1.3779**	**9.2587**	**3.6381**	**1.2691**	**4.9072**	**0.0000**	**6,499.587 5**	**6,499.587 5**	**1.4868**	**0.3384**	**6,637.599 8**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	3.0119	36.4112	21.2643	0.0644	3.5432	1.3779	4.9211	1.5464	1.2691	2.8155	0.0000	6,499.587 5	6,499.587 5	1.4868	0.3384	6,637.599 8
2023	1.8812	15.8123	19.7201	0.0415	1.1790	0.7120	1.8910	0.3176	0.6700	0.9876	0.0000	4,073.478 8	4,073.478 8	0.7176	0.1163	4,124.469 1
Maximum	**3.0119**	**36.4112**	**21.2643**	**0.0644**	**3.5432**	**1.3779**	**4.9211**	**1.5464**	**1.2691**	**2.8155**	**0.0000**	**6,499.587 5**	**6,499.587 5**	**1.4868**	**0.3384**	**6,637.599 8**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	47.88	0.00	38.90	52.88	0.00	35.48	0.00	0.00	0.00	0.00	0.00	0.00

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.1028	1.9000e-004	0.0213	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005		0.0457	0.0457	1.2000e-004		0.0487
Energy	5.4000e-004	4.9000e-003	4.1200e-003	3.0000e-005		3.7000e-004	3.7000e-004		3.7000e-004	3.7000e-004		5.8845	5.8845	1.1000e-004	1.1000e-004	5.9195
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.1033**	**5.0900e-003**	**0.0254**	**3.0000e-005**	**0.0000**	**4.5000e-004**	**4.5000e-004**	**0.0000**	**4.5000e-004**	**4.5000e-004**		**5.9302**	**5.9302**	**2.3000e-004**	**1.1000e-004**	**5.9682**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.1028	1.9000e-004	0.0213	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005		0.0457	0.0457	1.2000e-004		0.0487
Energy	5.4000e-004	4.9000e-003	4.1200e-003	3.0000e-005		3.7000e-004	3.7000e-004		3.7000e-004	3.7000e-004		5.8845	5.8845	1.1000e-004	1.1000e-004	5.9195
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.1033**	**5.0900e-003**	**0.0254**	**3.0000e-005**	**0.0000**	**4.5000e-004**	**4.5000e-004**	**0.0000**	**4.5000e-004**	**4.5000e-004**		**5.9302**	**5.9302**	**2.3000e-004**	**1.1000e-004**	**5.9682**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading	Grading	2/26/2022	3/25/2022	5	20	
2	Building Construction	Building Construction	3/26/2022	2/10/2023	5	230	
3	Paving	Paving	2/11/2023	3/10/2023	5	20	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 20

Acres of Paving: 4.7

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Grading	Crawler Tractors	2	7.00	212	0.43
Building Construction	Cranes	1	7.00	231	0.29
Grading	Excavators	1	8.00	158	0.38
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Grading	Graders	1	8.00	187	0.41
Paving	Pavers	2	8.00	130	0.42
Paving	Paving Equipment	2	8.00	132	0.36

Paving	Rollers	2	8.00	80	0.38
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Building Construction	9	86.00	34.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	8	20.00	0.00	625.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

3.2 Grading - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.1109	0.0000	7.1109	3.4290	0.0000	3.4290			0.0000			0.0000
Off-Road	2.8071	31.3395	19.3123	0.0433		1.3365	1.3365		1.2296	1.2296		4,196.646 1	4,196.646 1	1.3573		4,230.578 1
Total	**2.8071**	**31.3395**	**19.3123**	**0.0433**	**7.1109**	**1.3365**	**8.4473**	**3.4290**	**1.2296**	**4.6586**		**4,196.646 1**	**4,196.646 1**	**1.3573**		**4,230.578 1**

3.2 Grading - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.1366	5.0235	1.1942	0.0191	0.5464	0.0401	0.5865	0.1498	0.0383	0.1881		2,098.7124	2,098.7124	0.1242	0.3335	2,201.2062
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0682	0.0482	0.7577	2.0200e-003	0.2236	1.3400e-003	0.2249	0.0593	1.2300e-003	0.0605		204.2289	204.2289	5.3400e-003	4.8800e-003	205.8155
Total	**0.2048**	**5.0716**	**1.9519**	**0.0211**	**0.7700**	**0.0414**	**0.8114**	**0.2091**	**0.0396**	**0.2486**		**2,302.9414**	**2,302.9414**	**0.1296**	**0.3384**	**2,407.0217**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.7732	0.0000	2.7732	1.3373	0.0000	1.3373			0.0000			0.0000
Off-Road	2.8071	31.3395	19.3123	0.0433		1.3365	1.3365		1.2296	1.2296	0.0000	4,196.6461	4,196.6461	1.3573		4,230.5781
Total	**2.8071**	**31.3395**	**19.3123**	**0.0433**	**2.7732**	**1.3365**	**4.1097**	**1.3373**	**1.2296**	**2.5669**	**0.0000**	**4,196.6461**	**4,196.6461**	**1.3573**		**4,230.5781**

3.2 Grading - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.1366	5.0235	1.1942	0.0191	0.5464	0.0401	0.5865	0.1498	0.0383	0.1881		2,098.7124	2,098.7124	0.1242	0.3335	2,201.2062
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0682	0.0482	0.7577	2.0200e-003	0.2236	1.3400e-003	0.2249	0.0593	1.2300e-003	0.0605		204.2289	204.2289	5.3400e-003	4.8800e-003	205.8155
Total	**0.2048**	**5.0716**	**1.9519**	**0.0211**	**0.7700**	**0.0414**	**0.8114**	**0.2091**	**0.0396**	**0.2486**		**2,302.9414**	**2,302.9414**	**0.1296**	**0.3384**	**2,407.0217**

3.3 Building Construction - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.7062	15.6156	16.3634	0.0269		0.8090	0.8090		0.7612	0.7612		2,554.3336	2,554.3336	0.6120		2,569.6322
Total	**1.7062**	**15.6156**	**16.3634**	**0.0269**		**0.8090**	**0.8090**		**0.7612**	**0.7612**		**2,554.3336**	**2,554.3336**	**0.6120**		**2,569.6322**

3.3 Building Construction - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0621	1.6043	0.5366	6.5100e-003	0.2177	0.0164	0.2340	0.0627	0.0156	0.0783		702.2589	702.2589	0.0258	0.1020	733.2968
Worker	0.2934	0.2071	3.2583	8.6900e-003	0.9613	5.7600e-003	0.9670	0.2549	5.3000e-003	0.2602		878.1844	878.1844	0.0230	0.0210	885.0067
Total	**0.3555**	**1.8114**	**3.7949**	**0.0152**	**1.1790**	**0.0221**	**1.2011**	**0.3176**	**0.0209**	**0.3385**		**1,580.4433**	**1,580.4433**	**0.0488**	**0.1230**	**1,618.3035**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.7062	15.6156	16.3634	0.0269		0.8090	0.8090		0.7612	0.7612	0.0000	2,554.3336	2,554.3336	0.6120		2,569.6322
Total	**1.7062**	**15.6156**	**16.3634**	**0.0269**		**0.8090**	**0.8090**		**0.7612**	**0.7612**	**0.0000**	**2,554.3336**	**2,554.3336**	**0.6120**		**2,569.6322**

3.3 Building Construction - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0621	1.6043	0.5366	6.5100e-003	0.2177	0.0164	0.2340	0.0627	0.0156	0.0783		702.2589	702.2589	0.0258	0.1020	733.2968
Worker	0.2934	0.2071	3.2583	8.6900e-003	0.9613	5.7600e-003	0.9670	0.2549	5.3000e-003	0.2602		878.1844	878.1844	0.0230	0.0210	885.0067
Total	**0.3555**	**1.8114**	**3.7949**	**0.0152**	**1.1790**	**0.0221**	**1.2011**	**0.3176**	**0.0209**	**0.3385**		**1,580.4433**	**1,580.4433**	**0.0488**	**0.1230**	**1,618.3035**

3.3 Building Construction - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.5728	14.3849	16.2440	0.0269		0.6997	0.6997		0.6584	0.6584		2,555.2099	2,555.2099	0.6079		2,570.4061
Total	**1.5728**	**14.3849**	**16.2440**	**0.0269**		**0.6997**	**0.6997**		**0.6584**	**0.6584**		**2,555.2099**	**2,555.2099**	**0.6079**		**2,570.4061**

3.3 Building Construction - 2023

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0365	1.2442	0.4775	6.1900e-003	0.2177	6.8800e-003	0.2246	0.0627	6.5800e-003	0.0692		668.3725	668.3725	0.0247	0.0969	697.8786
Worker	0.2720	0.1832	2.9986	8.4100e-003	0.9613	5.4200e-003	0.9667	0.2549	4.9900e-003	0.2599		849.8963	849.8963	0.0206	0.0194	856.1845
Total	**0.3085**	**1.4274**	**3.4761**	**0.0146**	**1.1790**	**0.0123**	**1.1913**	**0.3176**	**0.0116**	**0.3292**		**1,518.2689**	**1,518.2689**	**0.0454**	**0.1163**	**1,554.0631**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.5728	14.3849	16.2440	0.0269		0.6997	0.6997		0.6584	0.6584	0.0000	2,555.2099	2,555.2099	0.6079		2,570.4061
Total	**1.5728**	**14.3849**	**16.2440**	**0.0269**		**0.6997**	**0.6997**		**0.6584**	**0.6584**	**0.0000**	**2,555.2099**	**2,555.2099**	**0.6079**		**2,570.4061**

3.3 Building Construction - 2023

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0365	1.2442	0.4775	6.1900e-003	0.2177	6.8800e-003	0.2246	0.0627	6.5800e-003	0.0692		668.3725	668.3725	0.0247	0.0969	697.8786
Worker	0.2720	0.1832	2.9986	8.4100e-003	0.9613	5.4200e-003	0.9667	0.2549	4.9900e-003	0.2599		849.8963	849.8963	0.0206	0.0194	856.1845
Total	**0.3085**	**1.4274**	**3.4761**	**0.0146**	**1.1790**	**0.0123**	**1.1913**	**0.3176**	**0.0116**	**0.3292**		**1,518.2689**	**1,518.2689**	**0.0454**	**0.1163**	**1,554.0631**

3.4 Paving - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.0327	10.1917	14.5842	0.0228		0.5102	0.5102		0.4694	0.4694		2,207.5841	2,207.5841	0.7140		2,225.4336
Paving	0.6157					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.6484**	**10.1917**	**14.5842**	**0.0228**		**0.5102**	**0.5102**		**0.4694**	**0.4694**		**2,207.5841**	**2,207.5841**	**0.7140**		**2,225.4336**

3.4 Paving - 2023

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0474	0.0320	0.5230	1.4700e-003	0.1677	9.4000e-004	0.1686	0.0445	8.7000e-004	0.0453		148.2377	148.2377	3.6000e-003	3.3800e-003	149.3345
Total	**0.0474**	**0.0320**	**0.5230**	**1.4700e-003**	**0.1677**	**9.4000e-004**	**0.1686**	**0.0445**	**8.7000e-004**	**0.0453**		**148.2377**	**148.2377**	**3.6000e-003**	**3.3800e-003**	**149.3345**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.0327	10.1917	14.5842	0.0228		0.5102	0.5102		0.4694	0.4694	0.0000	2,207.5841	2,207.5841	0.7140		2,225.4336
Paving	0.6157					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.6484**	**10.1917**	**14.5842**	**0.0228**		**0.5102**	**0.5102**		**0.4694**	**0.4694**	**0.0000**	**2,207.5841**	**2,207.5841**	**0.7140**		**2,225.4336**

3.4 Paving - 2023

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0474	0.0320	0.5230	1.4700e-003	0.1677	9.4000e-004	0.1686	0.0445	8.7000e-004	0.0453		148.2377	148.2377	3.6000e-003	3.3800e-003	149.3345
Total	**0.0474**	**0.0320**	**0.5230**	**1.4700e-003**	**0.1677**	**9.4000e-004**	**0.1686**	**0.0445**	**8.7000e-004**	**0.0453**		**148.2377**	**148.2377**	**3.6000e-003**	**3.3800e-003**	**149.3345**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Gasoline/Service Station	0.00	0.00	0.00		
Other Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Gasoline/Service Station	16.60	8.40	6.90	2.00	79.00	19.00	14	27	59
Other Asphalt Surfaces	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Gasoline/Service Station	0.544109	0.060768	0.184625	0.129879	0.023845	0.006339	0.011719	0.008584	0.000815	0.000515	0.024285	0.000743	0.003774
Other Asphalt Surfaces	0.544109	0.060768	0.184625	0.129879	0.023845	0.006339	0.011719	0.008584	0.000815	0.000515	0.024285	0.000743	0.003774

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	5.4000e-004	4.9000e-003	4.1200e-003	3.0000e-005		3.7000e-004	3.7000e-004		3.7000e-004	3.7000e-004		5.8845	5.8845	1.1000e-004	1.1000e-004	5.9195
NaturalGas Unmitigated	5.4000e-004	4.9000e-003	4.1200e-003	3.0000e-005		3.7000e-004	3.7000e-004		3.7000e-004	3.7000e-004		5.8845	5.8845	1.1000e-004	1.1000e-004	5.9195

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Gasoline/Service Station	50.0185	5.4000e-004	4.9000e-003	4.1200e-003	3.0000e-005		3.7000e-004	3.7000e-004		3.7000e-004	3.7000e-004		5.8845	5.8845	1.1000e-004	1.1000e-004	5.9195
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**5.4000e-004**	**4.9000e-003**	**4.1200e-003**	**3.0000e-005**		**3.7000e-004**	**3.7000e-004**		**3.7000e-004**	**3.7000e-004**		**5.8845**	**5.8845**	**1.1000e-004**	**1.1000e-004**	**5.9195**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Gasoline/Service Station	0.0500185	5.4000e-004	4.9000e-003	4.1200e-003	3.0000e-005		3.7000e-004	3.7000e-004		3.7000e-004	3.7000e-004		5.8845	5.8845	1.1000e-004	1.1000e-004	5.9195
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**5.4000e-004**	**4.9000e-003**	**4.1200e-003**	**3.0000e-005**		**3.7000e-004**	**3.7000e-004**		**3.7000e-004**	**3.7000e-004**		**5.8845**	**5.8845**	**1.1000e-004**	**1.1000e-004**	**5.9195**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.1028	1.9000e-004	0.0213	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005		0.0457	0.0457	1.2000e-004		0.0487
Unmitigated	0.1028	1.9000e-004	0.0213	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005		0.0457	0.0457	1.2000e-004		0.0487

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0170					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0838					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.9700e-003	1.9000e-004	0.0213	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005		0.0457	0.0457	1.2000e-004		0.0487
Total	**0.1028**	**1.9000e-004**	**0.0213**	**0.0000**		**8.0000e-005**	**8.0000e-005**		**8.0000e-005**	**8.0000e-005**		**0.0457**	**0.0457**	**1.2000e-004**		**0.0487**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0170					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0838					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.9700e-003	1.9000e-004	0.0213	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005		0.0457	0.0457	1.2000e-004		0.0487
Total	**0.1028**	**1.9000e-004**	**0.0213**	**0.0000**		**8.0000e-005**	**8.0000e-005**		**8.0000e-005**	**8.0000e-005**		**0.0457**	**0.0457**	**1.2000e-004**		**0.0487**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

Clean Energy Gas Station, San Bernardino

South Coast Air Basin, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Gasoline/Service Station	4.00	Pump	1.65	564.70	0
Other Asphalt Surfaces	204.88	1000sqft	4.70	204,882.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	10			**Operational Year**	2023
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	390.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - 6.4 acres total

Construction Phase -

Off-road Equipment - Grading: 1 excavator, 1 grader. 1 dozer, 3 loaderbackhoes, 2 tractors

Off-road Equipment - Construction: 1 crane, 3 forklifts, 1 gen set, 3 loader/backhoes, 1 welder

Off-road Equipment - Paving: 2 pavers, 2 paving equipment, 2 rollers

Grading - 5000 cy import

Vehicle Trips - construction emissions only

Construction Off-road Equipment Mitigation -

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

Table Name	Column Name	Default Value	New Value
tblGrading	AcresOfGrading	37.50	20.00
tblGrading	MaterialImported	0.00	5,000.00
tblLandUse	LotAcreage	0.01	1.65
tblOffRoadEquipment	LoadFactor	0.43	0.43
tblOffRoadEquipment	OffRoadEquipmentType		Crawler Tractors
tblVehicleTrips	ST_TR	182.17	0.00
tblVehicleTrips	SU_TR	166.88	0.00
tblVehicleTrips	WD_TR	172.01	0.00

2.0 Emissions Summary

Clean Energy Gas Station, San Bernardino - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.2356	2.1200	2.2074	4.8200e-003	0.1945	0.0969	0.2914	0.0676	0.0909	0.1585	0.0000	430.6145	430.6145	0.0735	0.0144	436.7395
2023	0.0451	0.3407	0.4437	8.6000e-004	0.0190	0.0158	0.0348	5.1200e-003	0.0148	0.0199	0.0000	76.2619	76.2619	0.0154	1.6400e-003	77.1354
Maximum	**0.2356**	**2.1200**	**2.2074**	**4.8200e-003**	**0.1945**	**0.0969**	**0.2914**	**0.0676**	**0.0909**	**0.1585**	**0.0000**	**430.6145**	**430.6145**	**0.0735**	**0.0144**	**436.7395**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.2356	2.1200	2.2074	4.8200e-003	0.1511	0.0969	0.2480	0.0467	0.0909	0.1376	0.0000	430.6142	430.6142	0.0735	0.0144	436.7392
2023	0.0451	0.3407	0.4437	8.6000e-004	0.0190	0.0158	0.0348	5.1200e-003	0.0148	0.0199	0.0000	76.2618	76.2618	0.0154	1.6400e-003	77.1353
Maximum	**0.2356**	**2.1200**	**2.2074**	**4.8200e-003**	**0.1511**	**0.0969**	**0.2480**	**0.0467**	**0.0909**	**0.1376**	**0.0000**	**430.6142**	**430.6142**	**0.0735**	**0.0144**	**436.7392**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**20.32**	**0.00**	**13.30**	**28.76**	**0.00**	**11.73**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**1-15-2022**	**4-14-2022**	0.5358	0.5358
2	**4-15-2022**	**7-14-2022**	0.6334	0.6334
3	**7-15-2022**	**10-14-2022**	0.6409	0.6409
4	**10-15-2022**	**1-14-2023**	0.6347	0.6347
5	**1-15-2023**	**4-14-2023**	0.2908	0.2908
		Highest	0.6409	0.6409

2.2 Overall Operational

<u>Unmitigated Operational</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0186	2.0000e-005	2.6700e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.1800e-003	5.1800e-003	1.0000e-005	0.0000	5.5200e-003
Energy	1.0000e-004	8.9000e-004	7.5000e-004	1.0000e-005		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005	0.0000	1.9677	1.9677	1.0000e-004	3.0000e-005	1.9786
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.4385	0.0000	0.4385	0.0259	0.0000	1.0863
Water						0.0000	0.0000		0.0000	0.0000	0.0169	0.1868	0.2037	1.7500e-003	4.0000e-005	0.2601
Total	**0.0187**	**9.1000e-004**	**3.4200e-003**	**1.0000e-005**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.4553**	**2.1597**	**2.6151**	**0.0278**	**7.0000e-005**	**3.3305**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0186	2.0000e-005	2.6700e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.1800e-003	5.1800e-003	1.0000e-005	0.0000	5.5200e-003
Energy	1.0000e-004	8.9000e-004	7.5000e-004	1.0000e-005		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005	0.0000	1.9677	1.9677	1.0000e-004	3.0000e-005	1.9786
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.4385	0.0000	0.4385	0.0259	0.0000	1.0863
Water						0.0000	0.0000		0.0000	0.0000	0.0169	0.1868	0.2037	1.7500e-003	4.0000e-005	0.2601
Total	**0.0187**	**9.1000e-004**	**3.4200e-003**	**1.0000e-005**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.4553**	**2.1597**	**2.6151**	**0.0278**	**7.0000e-005**	**3.3305**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading	Grading	2/26/2022	3/25/2022	5	20	
2	Building Construction	Building Construction	3/26/2022	2/10/2023	5	230	
3	Paving	Paving	2/11/2023	3/10/2023	5	20	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 20

Acres of Paving: 4.7

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Grading	Crawler Tractors	2	7.00	212	0.43
Building Construction	Cranes	1	7.00	231	0.29
Grading	Excavators	1	8.00	158	0.38
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Grading	Graders	1	8.00	187	0.41
Paving	Pavers	2	8.00	130	0.42
Paving	Paving Equipment	2	8.00	132	0.36
Paving	Rollers	2	8.00	80	0.38
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Building Construction	9	86.00	34.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	8	20.00	0.00	625.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

3.2 Grading - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0711	0.0000	0.0711	0.0343	0.0000	0.0343	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0281	0.3134	0.1931	4.3000e-004		0.0134	0.0134		0.0123	0.0123	0.0000	38.0713	38.0713	0.0123	0.0000	38.3792
Total	**0.0281**	**0.3134**	**0.1931**	**4.3000e-004**	**0.0711**	**0.0134**	**0.0845**	**0.0343**	**0.0123**	**0.0466**	**0.0000**	**38.0713**	**38.0713**	**0.0123**	**0.0000**	**38.3792**

3.2 Grading - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.3500e-003	0.0529	0.0120	1.9000e-004	5.3800e-003	4.0000e-004	5.7800e-003	1.4800e-003	3.8000e-004	1.8600e-003	0.0000	19.0414	19.0414	1.1300e-003	3.0300e-003	19.9714
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.7000e-004	5.4000e-004	7.0800e-003	2.0000e-005	2.1900e-003	1.0000e-005	2.2100e-003	5.8000e-004	1.0000e-005	6.0000e-004	0.0000	1.7741	1.7741	5.0000e-005	5.0000e-005	1.7895
Total	**2.0200e-003**	**0.0535**	**0.0191**	**2.1000e-004**	**7.5700e-003**	**4.1000e-004**	**7.9900e-003**	**2.0600e-003**	**3.9000e-004**	**2.4600e-003**	**0.0000**	**20.8155**	**20.8155**	**1.1800e-003**	**3.0800e-003**	**21.7609**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0277	0.0000	0.0277	0.0134	0.0000	0.0134	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0281	0.3134	0.1931	4.3000e-004		0.0134	0.0134		0.0123	0.0123	0.0000	38.0713	38.0713	0.0123	0.0000	38.3791
Total	**0.0281**	**0.3134**	**0.1931**	**4.3000e-004**	**0.0277**	**0.0134**	**0.0411**	**0.0134**	**0.0123**	**0.0257**	**0.0000**	**38.0713**	**38.0713**	**0.0123**	**0.0000**	**38.3791**

3.2 Grading - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.3500e-003	0.0529	0.0120	1.9000e-004	5.3800e-003	4.0000e-004	5.7800e-003	1.4800e-003	3.8000e-004	1.8600e-003	0.0000	19.0414	19.0414	1.1300e-003	3.0300e-003	19.9714
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.7000e-004	5.4000e-004	7.0800e-003	2.0000e-005	2.1900e-003	1.0000e-005	2.2100e-003	5.8000e-004	1.0000e-005	6.0000e-004	0.0000	1.7741	1.7741	5.0000e-005	5.0000e-005	1.7895
Total	**2.0200e-003**	**0.0535**	**0.0191**	**2.1000e-004**	**7.5700e-003**	**4.1000e-004**	**7.9900e-003**	**2.0600e-003**	**3.9000e-004**	**2.4600e-003**	**0.0000**	**20.8155**	**20.8155**	**1.1800e-003**	**3.0800e-003**	**21.7609**

3.3 Building Construction - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1706	1.5616	1.6363	2.6900e-003		0.0809	0.0809		0.0761	0.0761	0.0000	231.7252	231.7252	0.0555	0.0000	233.1131
Total	**0.1706**	**1.5616**	**1.6363**	**2.6900e-003**		**0.0809**	**0.0809**		**0.0761**	**0.0761**	**0.0000**	**231.7252**	**231.7252**	**0.0555**	**0.0000**	**233.1131**

3.3 Building Construction - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	6.1500e-003	0.1684	0.0545	6.5000e-004	0.0214	1.6400e-003	0.0231	6.1900e-003	1.5700e-003	7.7500e-003	0.0000	63.7177	63.7177	2.3400e-003	9.2600e-003	66.5360
Worker	0.0288	0.0233	0.3043	8.3000e-004	0.0944	5.8000e-004	0.0949	0.0251	5.3000e-004	0.0256	0.0000	76.2847	76.2847	2.1100e-003	2.0600e-003	76.9503
Total	**0.0349**	**0.1916**	**0.3588**	**1.4800e-003**	**0.1158**	**2.2200e-003**	**0.1180**	**0.0313**	**2.1000e-003**	**0.0333**	**0.0000**	**140.0024**	**140.0024**	**4.4500e-003**	**0.0113**	**143.4863**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1706	1.5616	1.6363	2.6900e-003		0.0809	0.0809		0.0761	0.0761	0.0000	231.7250	231.7250	0.0555	0.0000	233.1128
Total	**0.1706**	**1.5616**	**1.6363**	**2.6900e-003**		**0.0809**	**0.0809**		**0.0761**	**0.0761**	**0.0000**	**231.7250**	**231.7250**	**0.0555**	**0.0000**	**233.1128**

3.3 Building Construction - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	6.1500e-003	0.1684	0.0545	6.5000e-004	0.0214	1.6400e-003	0.0231	6.1900e-003	1.5700e-003	7.7500e-003	0.0000	63.7177	63.7177	2.3400e-003	9.2600e-003	66.5360
Worker	0.0288	0.0233	0.3043	8.3000e-004	0.0944	5.8000e-004	0.0949	0.0251	5.3000e-004	0.0256	0.0000	76.2847	76.2847	2.1100e-003	2.0600e-003	76.9503
Total	**0.0349**	**0.1916**	**0.3588**	**1.4800e-003**	**0.1158**	**2.2200e-003**	**0.1180**	**0.0313**	**2.1000e-003**	**0.0333**	**0.0000**	**140.0024**	**140.0024**	**4.4500e-003**	**0.0113**	**143.4863**

3.3 Building Construction - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0236	0.2158	0.2437	4.0000e-004		0.0105	0.0105		9.8800e-003	9.8800e-003	0.0000	34.7707	34.7707	8.2700e-003	0.0000	34.9775
Total	**0.0236**	**0.2158**	**0.2437**	**4.0000e-004**		**0.0105**	**0.0105**		**9.8800e-003**	**9.8800e-003**	**0.0000**	**34.7707**	**34.7707**	**8.2700e-003**	**0.0000**	**34.9775**

3.3 Building Construction - 2023

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	5.4000e-004	0.0196	7.2700e-003	9.0000e-005	3.2200e-003	1.0000e-004	3.3200e-003	9.3000e-004	1.0000e-004	1.0300e-003	0.0000	9.1014	9.1014	3.4000e-004	1.3200e-003	9.5035
Worker	4.0100e-003	3.0900e-003	0.0421	1.2000e-004	0.0142	8.0000e-005	0.0142	3.7600e-003	7.0000e-005	3.8300e-003	0.0000	11.0751	11.0751	2.8000e-004	2.8000e-004	11.1670
Total	**4.5500e-003**	**0.0227**	**0.0493**	**2.1000e-004**	**0.0174**	**1.8000e-004**	**0.0176**	**4.6900e-003**	**1.7000e-004**	**4.8600e-003**	**0.0000**	**20.1765**	**20.1765**	**6.2000e-004**	**1.6000e-003**	**20.6706**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0236	0.2158	0.2437	4.0000e-004		0.0105	0.0105		9.8800e-003	9.8800e-003	0.0000	34.7707	34.7707	8.2700e-003	0.0000	34.9775
Total	**0.0236**	**0.2158**	**0.2437**	**4.0000e-004**		**0.0105**	**0.0105**		**9.8800e-003**	**9.8800e-003**	**0.0000**	**34.7707**	**34.7707**	**8.2700e-003**	**0.0000**	**34.9775**

3.3 Building Construction - 2023

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	5.4000e-004	0.0196	7.2700e-003	9.0000e-005	3.2200e-003	1.0000e-004	3.3200e-003	9.3000e-004	1.0000e-004	1.0300e-003	0.0000	9.1014	9.1014	3.4000e-004	1.3200e-003	9.5035
Worker	4.0100e-003	3.0900e-003	0.0421	1.2000e-004	0.0142	8.0000e-005	0.0142	3.7600e-003	7.0000e-005	3.8300e-003	0.0000	11.0751	11.0751	2.8000e-004	2.8000e-004	11.1670
Total	**4.5500e-003**	**0.0227**	**0.0493**	**2.1000e-004**	**0.0174**	**1.8000e-004**	**0.0176**	**4.6900e-003**	**1.7000e-004**	**4.8600e-003**	**0.0000**	**20.1765**	**20.1765**	**6.2000e-004**	**1.6000e-003**	**20.6706**

3.4 Paving - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0103	0.1019	0.1458	2.3000e-004		5.1000e-003	5.1000e-003		4.6900e-003	4.6900e-003	0.0000	20.0269	20.0269	6.4800e-003	0.0000	20.1888
Paving	6.1600e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0165**	**0.1019**	**0.1458**	**2.3000e-004**		**5.1000e-003**	**5.1000e-003**		**4.6900e-003**	**4.6900e-003**	**0.0000**	**20.0269**	**20.0269**	**6.4800e-003**	**0.0000**	**20.1888**

3.4 Paving - 2023

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.7000e-004	3.6000e-004	4.8900e-003	1.0000e-005	1.6500e-003	1.0000e-005	1.6600e-003	4.4000e-004	1.0000e-005	4.5000e-004	0.0000	1.2878	1.2878	3.0000e-005	3.0000e-005	1.2985
Total	**4.7000e-004**	**3.6000e-004**	**4.8900e-003**	**1.0000e-005**	**1.6500e-003**	**1.0000e-005**	**1.6600e-003**	**4.4000e-004**	**1.0000e-005**	**4.5000e-004**	**0.0000**	**1.2878**	**1.2878**	**3.0000e-005**	**3.0000e-005**	**1.2985**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0103	0.1019	0.1458	2.3000e-004		5.1000e-003	5.1000e-003		4.6900e-003	4.6900e-003	0.0000	20.0268	20.0268	6.4800e-003	0.0000	20.1888
Paving	6.1600e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0165**	**0.1019**	**0.1458**	**2.3000e-004**		**5.1000e-003**	**5.1000e-003**		**4.6900e-003**	**4.6900e-003**	**0.0000**	**20.0268**	**20.0268**	**6.4800e-003**	**0.0000**	**20.1888**

3.4 Paving - 2023

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.7000e-004	3.6000e-004	4.8900e-003	1.0000e-005	1.6500e-003	1.0000e-005	1.6600e-003	4.4000e-004	1.0000e-005	4.5000e-004	0.0000	1.2878	1.2878	3.0000e-005	3.0000e-005	1.2985
Total	**4.7000e-004**	**3.6000e-004**	**4.8900e-003**	**1.0000e-005**	**1.6500e-003**	**1.0000e-005**	**1.6600e-003**	**4.4000e-004**	**1.0000e-005**	**4.5000e-004**	**0.0000**	**1.2878**	**1.2878**	**3.0000e-005**	**3.0000e-005**	**1.2985**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Gasoline/Service Station	0.00	0.00	0.00		
Other Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Gasoline/Service Station	16.60	8.40	6.90	2.00	79.00	19.00	14	27	59
Other Asphalt Surfaces	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Gasoline/Service Station	0.544109	0.060768	0.184625	0.129879	0.023845	0.006339	0.011719	0.008584	0.000815	0.000515	0.024285	0.000743	0.003774
Other Asphalt Surfaces	0.544109	0.060768	0.184625	0.129879	0.023845	0.006339	0.011719	0.008584	0.000815	0.000515	0.024285	0.000743	0.003774

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.9935	0.9935	8.0000e-005	1.0000e-005	0.9986
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.9935	0.9935	8.0000e-005	1.0000e-005	0.9986
NaturalGas Mitigated	1.0000e-004	8.9000e-004	7.5000e-004	1.0000e-005		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005	0.0000	0.9743	0.9743	2.0000e-005	2.0000e-005	0.9800
NaturalGas Unmitigated	1.0000e-004	8.9000e-004	7.5000e-004	1.0000e-005		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005	0.0000	0.9743	0.9743	2.0000e-005	2.0000e-005	0.9800

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Gasoline/Service Station	18256.8	1.0000e-004	8.9000e-004	7.5000e-004	1.0000e-005		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005	0.0000	0.9743	0.9743	2.0000e-005	2.0000e-005	0.9800
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**1.0000e-004**	**8.9000e-004**	**7.5000e-004**	**1.0000e-005**		**7.0000e-005**	**7.0000e-005**		**7.0000e-005**	**7.0000e-005**	**0.0000**	**0.9743**	**0.9743**	**2.0000e-005**	**2.0000e-005**	**0.9800**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Gasoline/Service Station	18256.8	1.0000e-004	8.9000e-004	7.5000e-004	1.0000e-005		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005	0.0000	0.9743	0.9743	2.0000e-005	2.0000e-005	0.9800
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**1.0000e-004**	**8.9000e-004**	**7.5000e-004**	**1.0000e-005**		**7.0000e-005**	**7.0000e-005**		**7.0000e-005**	**7.0000e-005**	**0.0000**	**0.9743**	**0.9743**	**2.0000e-005**	**2.0000e-005**	**0.9800**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Gasoline/Service Station	5601.82	0.9935	8.0000e-005	1.0000e-005	0.9986
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.9935**	**8.0000e-005**	**1.0000e-005**	**0.9986**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Gasoline/Service Station	5601.82	0.9935	8.0000e-005	1.0000e-005	0.9986
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.9935**	**8.0000e-005**	**1.0000e-005**	**0.9986**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0186	2.0000e-005	2.6700e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.1800e-003	5.1800e-003	1.0000e-005	0.0000	5.5200e-003
Unmitigated	0.0186	2.0000e-005	2.6700e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.1800e-003	5.1800e-003	1.0000e-005	0.0000	5.5200e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	3.1100e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0153					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.5000e-004	2.0000e-005	2.6700e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.1800e-003	5.1800e-003	1.0000e-005	0.0000	5.5200e-003
Total	**0.0186**	**2.0000e-005**	**2.6700e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**5.1800e-003**	**5.1800e-003**	**1.0000e-005**	**0.0000**	**5.5200e-003**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	3.1100e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0153					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.5000e-004	2.0000e-005	2.6700e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.1800e-003	5.1800e-003	1.0000e-005	0.0000	5.5200e-003
Total	**0.0186**	**2.0000e-005**	**2.6700e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**5.1800e-003**	**5.1800e-003**	**1.0000e-005**	**0.0000**	**5.5200e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.2037	1.7500e-003	4.0000e-005	0.2601
Unmitigated	0.2037	1.7500e-003	4.0000e-005	0.2601

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Gasoline/Service Station	0.0531276 / 0.0325621	0.2037	1.7500e-003	4.0000e-005	0.2601
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.2037**	**1.7500e-003**	**4.0000e-005**	**0.2601**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Gasoline/Service Station	0.0531276 / 0.0325621	0.2037	1.7500e-003	4.0000e-005	0.2601
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.2037**	**1.7500e-003**	**4.0000e-005**	**0.2601**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.4385	0.0259	0.0000	1.0863
Unmitigated	0.4385	0.0259	0.0000	1.0863

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Gasoline/Service Station	2.16	0.4385	0.0259	0.0000	1.0863
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.4385**	**0.0259**	**0.0000**	**1.0863**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Gasoline/Service Station	2.16	0.4385	0.0259	0.0000	1.0863
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.4385**	**0.0259**	**0.0000**	**1.0863**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

APPENDIX 2

Biological Resources Assessment & Jurisdictional Delineation Report

Jacobs

Clean Energy's
San Bernardino CNG Fueling Station Project

Biological Resources Assessment And Jurisdictional Delineation Report

Document No. | FINAL

October 2021

Tom Dodson & Associates

Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved

Distribution of copies

Revision	Issue approve	Date issued	Issued to	Comments

Jacobs

Clean Energy's San Bernardino CNG Fueling Station Project

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Executive Summary

Jacobs Engineering Group, Inc. was retained by Tom Dodson and Associates to conduct a Biological Resources Assessment and Jurisdictional Delineation for Clean Energy's proposed San Bernardino CNG Fueling Station Project. The proposed Project would construct a Compressed Natural Gas vehicle fueling station in the City of San Bernardino, San Bernardino County, California.

In September of 2021, Jacobs biologists conducted a Biological Resources Assessment survey to address potential effects of the Project on designated Critical Habitats and/or special status species. Results of the Biological Resources Assessment are intended to provide sufficient baseline information to the Project Proponent and, if required, to City and/or County planning officials and federal and state regulatory agencies to determine if the Project is likely to result in any adverse effects on sensitive biological resources and to identify mitigation measures to offset those effects. Data regarding biological resources in the Project vicinity were obtained through literature review and field investigation. Available databases and documentation relevant to the Project Area were reviewed for documented occurrences of sensitive species that could potentially occur in the Project vicinity, including the U.S. Fish and Wildlife Service designated Critical Habitat online mapper and Information for Planning and Consultation System, as well as the most recent versions of the California Natural Diversity Database and California Native Plant Society Electronic Inventory. The result of the reconnaissance-level field survey was that no state or federally listed species were identified within the Project Area and the Project is not within any federal Critical Habitat. Due to the environmental conditions on site and the adjacent disturbances, the Project Area is likely not suitable to support any of the special status wildlife species that have been documented in the Project vicinity (within approximately 1 mile).

Jacobs biologists also assessed the Project Area for the presence of state and/or federal jurisdictional waters that may potentially be impacted by the Project. The jurisdictional waters assessment was conducted in accordance with the U.S. Army Corps of Engineers *Wetlands Delineation Manual, Jurisdictional Determination Form Instructional Guidebook,* and *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region*. The result of the jurisdictional waters assessment is that there are no wetland or non-wetland jurisdictional waters within the Project Area. Therefore, the Project will not impact any jurisdictional waters and no state or federal jurisdictional waters permitting will be required under current regulation.

This report describes delineated resources, provides an aquatic resource delineation map, identifies state and/or federally listed species with potential to occur on site and presents representative site photographs. The delineation results and conclusions presented in this report are considered preliminary and valid under current regulatory context. Additionally, according to protocol and standard practices, the results of the habitat assessment surveys will remain valid for the period of one year, or until September 2022, after which time, if the site has not been disturbed in the interim, another survey may be required to determine the persisting absence of special status species and to verify environmental conditions on site. Regardless of survey results and conclusions given herein, if any state or federally listed species are found on site during Project-related work activities, all activities likely to affect the animal(s) should cease immediately and regulatory agencies should be contacted to determine appropriate management actions.

1. Introduction

Clean Energy has applied for a Conditional Use Permit to establish and operate a Compressed Natural Gas (CNG) vehicle fueling station, which the Company terms a "Green Truck Launchpad Facility (Facility)." The purpose of Facility is to facilitate decrease in greenhouse gas emissions through ongoing efforts to replace existing diesel fleet trucks with Green Trucks (trucks that utilize low carbon Renewable Natural Gas [RNG]). These will be commercial fleet vehicles, with dedicated time-fill for a contracted commercial fleet customer and fast-fill dispensers for other commercial vehicles. The station will be open to vehicles owned by third party commercial customers, but this is not the primary purpose of the Facility. Clean Energy does not own or rent vehicles and this site will not function as a "truck transportation yard" because it does not include servicing or maintaining trucks. Trucks will be parked at the proposed Facility for fueling purposes only. The car parking spaces are intended for the truck drivers to park personal vehicles during working hours.

On behalf of Tom Dodson and Associates (TDA), Jacobs Engineering Group, Inc. (Jacobs) has prepared this Biological Resources Assessment (BRA) report for Clean Energy's proposed San Bernardino CNG Fueling Station (Project) located in the City of San Bernardino, San Bernardino County, California. The BRA fieldwork was conducted by Jacobs biologist Daniel Smith in September of 2021. The purpose of the BRA survey was to address potential effects of the Project on designated Critical Habitats and/or any species currently listed or formally proposed for listing as endangered or threatened under the federal Endangered Species Act (ESA) and/or the California Endangered Species Act (CESA), as well as any species otherwise designated as sensitive by the California Department of Fish and Wildlife (CDFW [formerly California Department of Fish and Game]) and/or the California Native Plant Society (CNPS).

The Project Area was assessed for sensitive species known to occur locally. Attention was focused on those state and/or federally listed as threatened or endangered species and California Fully Protected species that have been documented in the vicinity of the Project Area, whose habitat requirements are present within or adjacent to the Project Area. Results of the habitat assessment are intended to provide sufficient baseline information to the Project Proponent (Clean Energy) and, if required, to City, County or other local government planning officials and federal and state regulatory agencies, including the U.S. Fish and Wildlife Service (USFWS) and CDFW, respectively, to determine if the Project is likely to result in any adverse effects on sensitive biological resources and to identify mitigation measures to offset those effects.

In addition to the BRA survey, Jacobs biologists assessed the Project Area for the presence of state and/or federal jurisdictional waters potentially subject to regulation by the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act (CWA), Regional Water Quality Control Board (RWQCB) under Section 401 of the CWA and Porter Cologne Water Quality Control Act, and CDFW under Section 1600 of the California Fish and Game Code (FGC), respectively.

1.1 Project Description

The proposed Facility would consist of up to four "fast-fill" CNG dispensers and 153 (Phase 1) Truck Time-Fill Parking Spaces on an approximately 6.4-acre parcel (Assessor Parcel Number [APN]: 0280-091-27-0-000). At a general descriptive level, the following facilities will be installed (refer to Figure 1 on Page 3):

- the vehicle fast-fill CNG dispensing station;
- associated control equipment pads;
- interconnecting piping;
- electrical and safety systems;
- modular fueling canopy;
- three CNG storage vessels and concrete pad;

- two dryers;
- four compressors;
- switch gear and transformer;
- 153 truck time-fill parking spaces (Phase 1) (asphalt parking area);
- 151 regular parking spaces (Phase 1);
- 6-foot chain length fence surrounding the property;
- three gates (two on Central for routine access) and one on Tippecanoe for emergency access);
- two bioretention basins to capture onsite storm water runoff; and
- landscaping.

The refueling equipment compound encompasses approximately 72,270 square feet (sf, appx. 1.65 acres). The time-fill parking area and the vehicle parking area encompass approximately 204,882 sf (appx. 4.70 acres). Landscaping on the site encompasses approximately 36,859 sf (appx. 0.84 acre).

The Project envisions two phases of development. Initially, two fast-fill dispensers, the support systems and equipment, the canopy and 153 truck time-fill parking spaces and 151 regular parking spaces will be installed. During Phase 2 the project envisions installing two additional fast-fill dispensers, 62 additional truck time-fill parking spaces, and 89 additional regular parking spaces. Phase 1 will convert 25 regular parking spaces to 18 truck spaces for Phase 2. Final development is a total of 215 truck spaces and 215 regular spaces.

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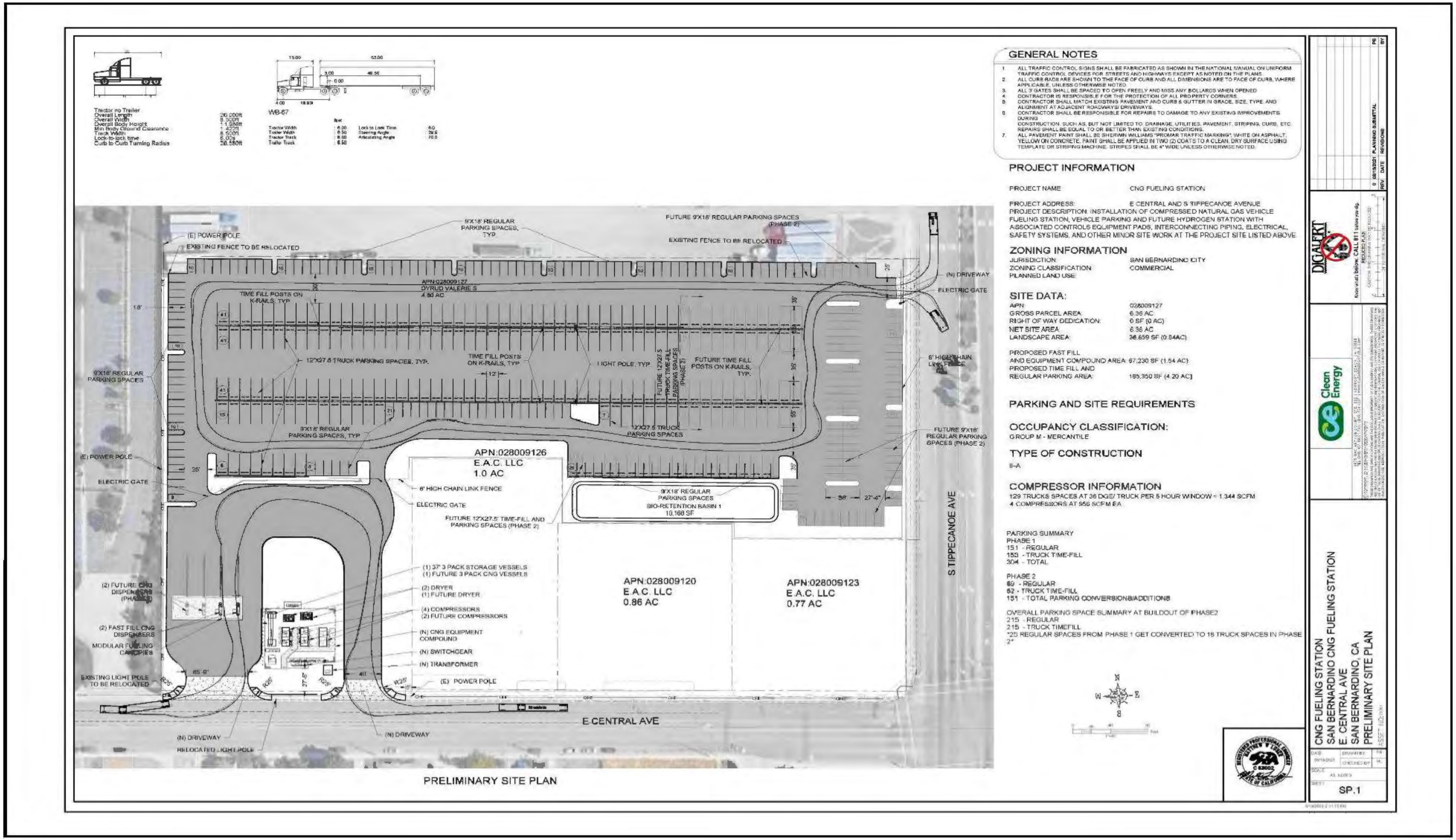

SOURCE: Tom Dodson and Associates, from Clean Energy

FIGURE 1

Jacobs

Preliminary Site Plan
Clean Energy's San Bernardino CNG Fueling Station Project

1.1.1 Construction Sequence

The following is a general construction sequence that will be adjusted by the Project Proponent to conform to the specific site conditions at the time of actual construction:

1. clear and grub;
2. preparation of subgrade;
3. mass-grade site and road beds;
4. installation of the onsite storm drain system;
5. installation of public sewer system; (no public sewer system to be installed)
6. installation of public water system; (no public water system; private irrigation only)
7. fine grade to prepare for surface improvements;
8. installation of building foundations;
9. install water quality, including water quality infrastructure;
10. install curb, gutters, sidewalks and first asphalt and concrete lift;
11. surface improvements on adjacent roadways;
12. complete building construction;
13. install landscaping; place final lift of asphalt and concrete lift; and
14. install signage and striping.

Minimal above-ground structures will be installed. It is anticipated that total Phase 1 construction will require approximately eight months to complete.

The Project construction is designed to minimize earthwork activities by matching existing drainage patterns, with approximately 5,000 C.Y. of import. It is anticipated that construction will require a maximum of 20-30 employees onsite at various times during the 8-month construction schedule. Daily truck deliveries are forecast to reach a maximum during asphalt and concrete activities of 4 to 6 deliveries per day, over a period of 2 weeks.

1.1.2 Operations

The Facility will be available to authorized fleet customers 24 hours per day, 7 days per week. The Facility will operate as a "cardlock" access operation with no dedicated onsite employees and Facility activation by card readers. This Facility will be monitored by camera and a company service representative call center 24-hours/7-days per week. Clean Energy technicians will dispatch to the site for regularly scheduled maintenance and on demand, as required. Fuel dispensing is only available by authorized card readers.

1.2 Location

The Project is generally located in the City of San Bernardino, San Bernardino County, California, in Sections 13 and 14 of Township 1 South, Range 4 West, San Bernardino Base Meridian (Figures 2 & 3). The Project Area is depicted on the *San Bernardino South* U. S. Geological Survey's (USGS) 7.5-Minute Series Quadrangle map. Specifically, the Project site is located on the northwest corner of Central Avenue and Tippecanoe Avenue, approximately 1.5 miles north of Interstate 10 (I-10). The Latitude and Longitude for the Project site is 34°5'12.31" N and 117°15'43.32" W, respectively. Please refer to Figures 2-4 for the regional and site location maps.

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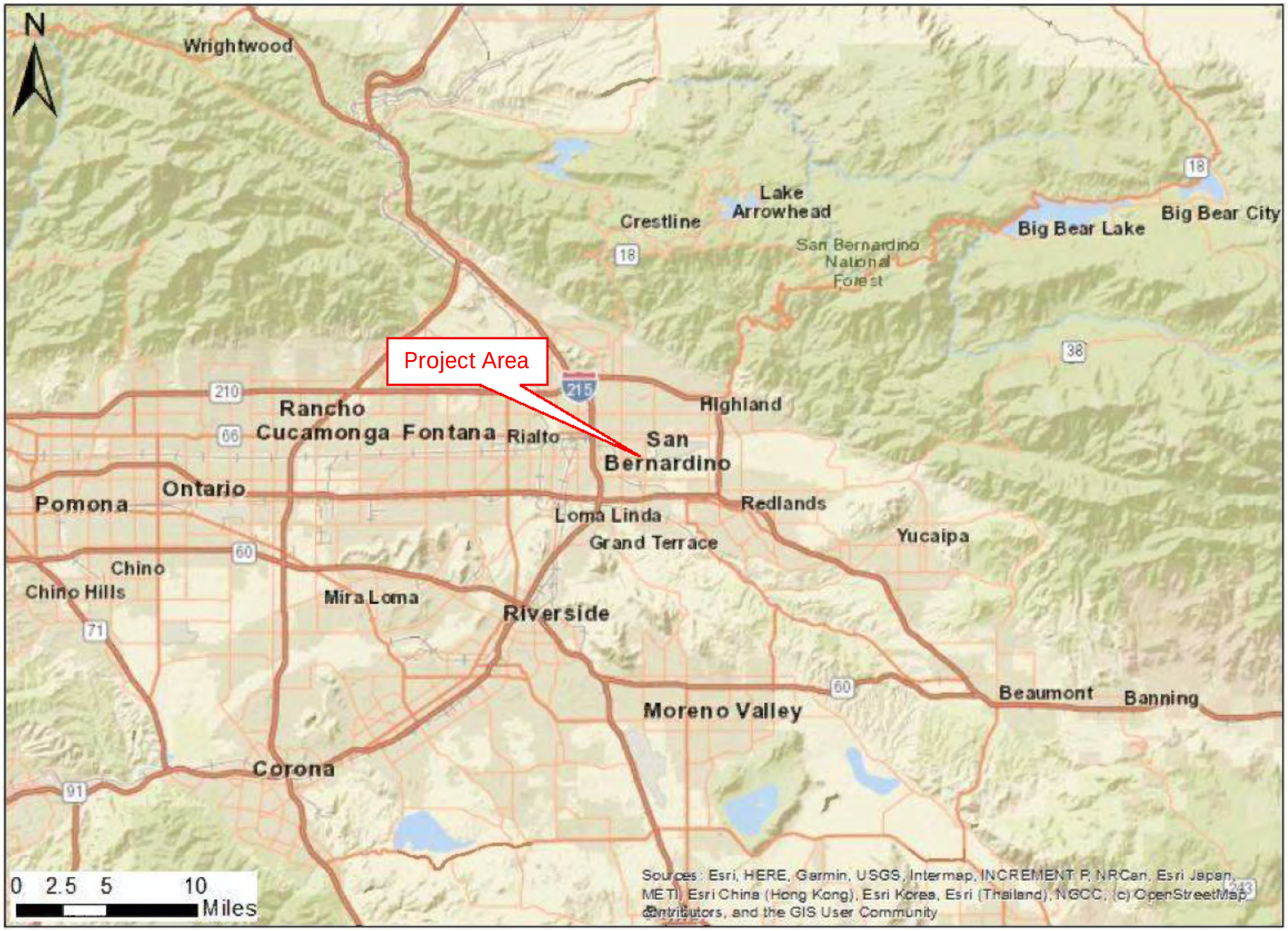

SOURCE: Esri ArcMap 10.6 – World Street Map 1:500,000 scale

FIGURE 2

Jacobs

Regional Location
Clean Energy's San Bernardino CNG Fueling Station Project

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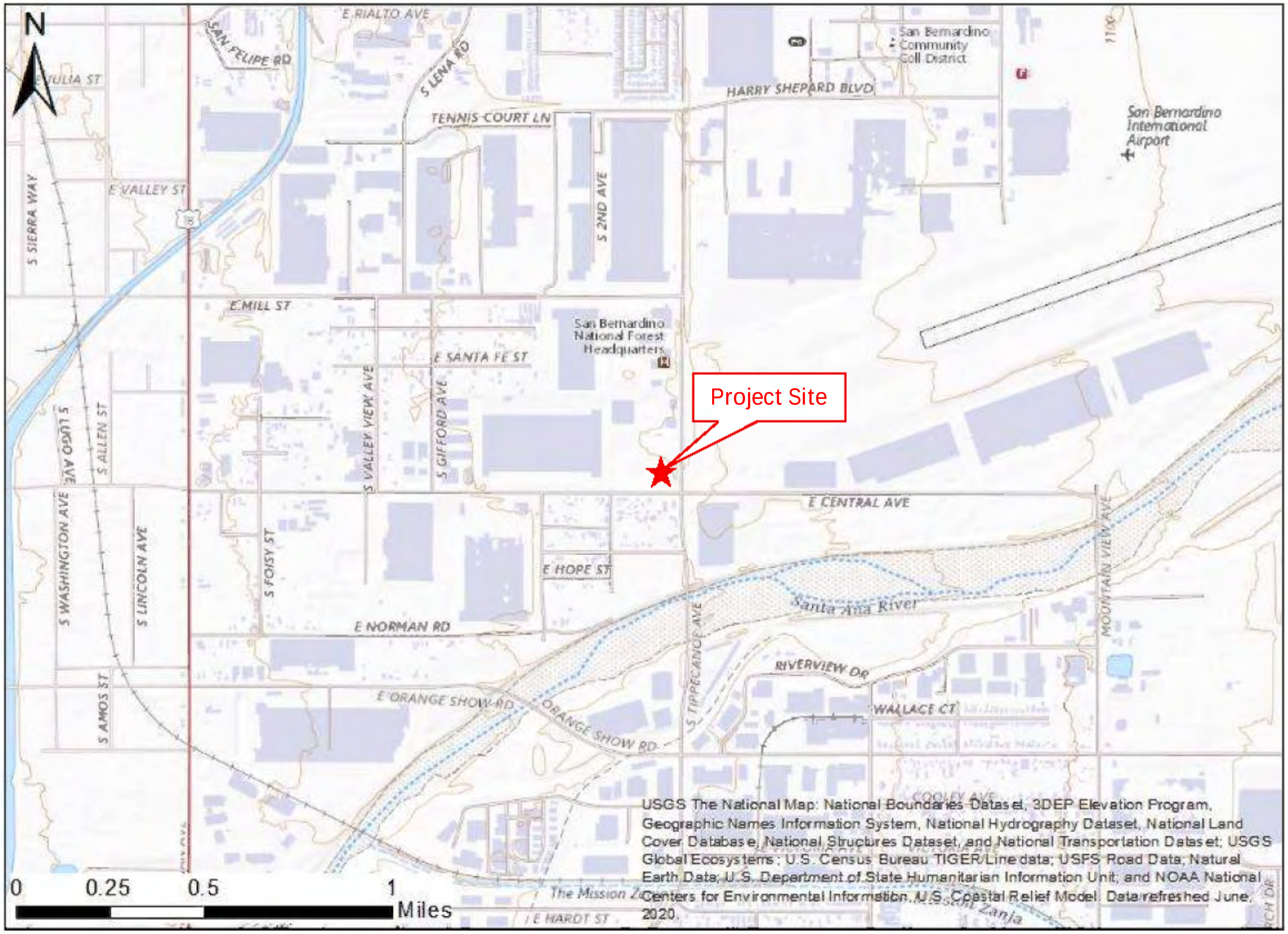

SOURCE: Esri ArcMap 10.6 – USGS Topo 1:24,000 scale

FIGURE 3

Jacobs

Topographic Map of Project Location

Clean Energy's San Bernardino CNG Fueling Station Project

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SOURCE: Esri ArcMap 10.6 – USGS Topo 1:2,500 scale

FIGURE 4

Jacobs	**Aerial Photo of Project Site** Clean Energy's San Bernardino CNG Fueling Station Project

1.3 Environmental Setting

The Project Area lies in the geographically based ecological classification known as the Inland Valleys – Level IV ecoregion, of the Southern California/Northern Baja Coast – Level III ecoregion (Griffith et al. 2016). The goal of regional ecological classifications is to reduce variability based on spatial covariance in climate, geology, topography, climax vegetation, hydrology, and soils. The Inland Valleys ecoregion is a heavily urbanized ecoregion that historically consisted of the alluvial fans and basin floors immediately south of the San Gabriel and San Bernardino Mountains (Griffith et al. 2016).

The Project Area is situated along the north side of the historic Santa Ana River floodplain in the San Bernardino Valley, between the San Bernardino Mountains to the north and The Badlands to the south. The topography of the Project site consists of a flat landscape. The elevation of the Project site is approximately 1,055 feet above mean sea level (amsl).

The Project Area is within a hot-summer Mediterranean climate (Csa), characterized by both seasonal and annual variations in temperature and precipitation. Average annual maximum temperatures peak at 96.2 degrees Fahrenheit (° F) in July and August and drop to an average annual minimum temperature of 38.5° F in January. Average annual precipitation is greatest from November through April and reaches a peak in February (3.25 inches). Precipitation is lowest in the month of July (0.04 inches). Annual total precipitation averages 16.12 inches.

Hydrologically, the Project Area is situated within the Bunker Hill Hydrologic Sub-Area (HSA 801.52). The Bunker Hill HSA comprises a 124,791-acre drainage area, within the larger Santa Ana Watershed (HUC 18070203). The Santa Ana River is the major hydrogeomorphic feature within the Santa Ana Watershed. The Santa Ana River flows generally northeast to southwest, approximately 0.21 miles south of the Project site at its closest point.

Soils within the Project Area consist entirely of Tujunga gravelly loamy sand, 0 to 9 percent slopes. This soil type consists of gravelly loamy sand and gravelly sand layers comprised of alluvium derived from granite. This soil type is somewhat excessively drained, with a very low runoff class and does not have a hydric soil rating.

The Project Area is entirely within an urban landscape that no longer supports any native habitat. The Project site previously consisted of olive groves but currently consists mostly of bare ground, with several scattered trees and ruderal plant species. Surrounding land use consists entirely of commercial/industrial and residential development (Figures 3&4).

2. Assessment Methodology

2.1 Biological Resources Assessment

Data regarding biological resources in the Project vicinity were obtained through literature review, desktop evaluation and field investigation. Prior to performing the field survey, available databases, and documentation relevant to the Project Area were reviewed for documented occurrences of sensitive species that could potentially occur in the Project vicinity. The USFWS designated Critical Habitat online mapper, USFWS threatened and endangered species occurrence data overlay, and the most recent versions of the California Natural Diversity Database (CNDDB) and California Native Plant Society Electronic Inventory (CNPSEI) databases were searched for sensitive species data in the *San Bernardino South* and *Redlands* USGS 7.5-Minute Series Quadrangles. The Project site is situated within the eastern portion of the *San Bernardino South* quad and the sites' proximity to the *Redlands* quad led to its inclusion in the review. These databases contain records of reported occurrences of state and federally listed species or otherwise sensitive species and habitats that may occur within the vicinity of the Project site (approximately 1 mile). Other available technical information on the biological resources of the area was also reviewed including previous surveys and recent findings.

2.1.1 Biological Resources Assessment Field Survey

Jacobs biologist Daniel Smith conducted a biological resources assessment of the Project Area on September 28, 2021. The reconnaissance-level field survey consisted of a pedestrian survey that encompassed the entire Project Area and included 100 percent visual coverage of the site and immediate surrounding area. Wildlife species were detected during field surveys by sight, calls, tracks, scat, and/or other sign. In addition to species observed, expected wildlife usage of the site was determined based on known habitat preferences of regional wildlife species and knowledge of their relative distributions in the area. The focus of the faunal species survey was to identify potential habitat for special status wildlife that may occur within the Project vicinity.

2.2 Jurisdictional Delineation

On September 28, 2021, Mr. Smith also evaluated the Project Area for the presence of riverine/riparian/wetland habitat and jurisdictional waters, i.e. Waters of the U.S. (WOTUS), as regulated by the USACE and RWQCB, and/or jurisdictional streambed and associated riparian habitat as regulated by the CDFW. Prior to the field visit, aerial photographs of the Project Area were viewed and compared with the surrounding USGS 7.5-Minute Topographic Quadrangle maps to identify drainage features within the survey area as indicated from topographic changes, blue-line features, or visible drainage patterns. The USFWS National Wetland Inventory (NWI) and Environmental Protection Agency (EPA) Water Program "My Waters" Google Earth Pro data layers were also reviewed to determine whether any hydrologic features and wetland areas had been documented within the vicinity of the site. Similarly, the United States Department of Agriculture (USDA) – Natural Resources Conservation Service (NRCS) "Web Soil Survey" was reviewed for soil types found within the Project Area to identify the soil series in the area and to check these soils to determine whether they are regionally identified as hydric soils. Upstream and downstream connectivity of waterways (if present) were reviewed on Google Earth Pro aerial photographs and topographic maps to determine jurisdictional status. The lateral extent of potential USACE jurisdiction was measured at the Ordinary High Water Mark (OHWM) in accordance with regulations set forth in 33CFR part 328 and the USACE guidance documents listed below:

- *USACE – Corps of Engineers Wetlands Delineation Manual, Wetlands Research Program Technical Report Y-87-1 (on-line edition), January 1987 - Final Report.*
- *USACE – Jurisdictional Determination Form Instructional Guidebook (JD Form Guidebook), May 30, 2007.*

- *USACE – A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States (A Delineation Manual), August 2008.*
- *USACE – Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0), September 2008.*
- *USACE – Minimum Standards for Acceptance of Aquatic Resources Delineation Reports (Minimum Standards), January 2016.*
- *The Environmental Protection Agency (EPA) and the Department of the Army's "Navigable Waters Protection Rule: Definition of 'Waters of the United States,'" April 21, 2020 (effective June 22, 2020) (85 FR 22250).*

To be considered a *jurisdictional wetland* under the federal CWA, Section 404, an area must possess three (3) wetland characteristics: hydrophytic *vegetation*, hydric *soils*, and wetland *hydrology*.

► Hydrophytic vegetation: Hydrophytic vegetation is plant life that grows, and is typically adapted for life, in permanently or periodically saturated soils. The hydrophytic vegetation criterion is met if more than 50 percent of the dominant plant species from all strata (tree, shrub, and herb layers) is considered hydrophytic. Hydrophytic species are those included on the 2018 National Wetland Plant Lists for the Arid West Region (USACE 2018). Each species on the lists is rated with a wetland indicator category, as shown in Table 1. To be considered hydrophytic, the species must have *wetland indicator status*, i.e., be rated as OBL, FACW or FAC.

Table 1. Wetland Indicator Vegetation Categories

Category	Probability
Obligate Wetland (OBL)	Almost always occur in wetlands (estimated probability >99%)
Facultative Wetland (FACW)	Usually occur in wetlands (estimated probability 67 to 99%)
Facultative (FAC)	Equally likely to occur in wetlands and non-wetlands (estimated probability 34 to 66%)
Facultative Upland (FACU)	Usually occur in non-wetlands (estimated probability 67 to 99%)
Obligate Upland (UPL)	Almost always occur in non-wetlands (estimated probability >99%)

► Hydric Soil: Soil maps from the USDA-NRCS Web Soil Survey (USDA 2021) were reviewed for soil types found within the Project Area. Hydric soils are saturated or inundated long enough during the growing season to develop anaerobic conditions that favor growth and regeneration of hydrophytic vegetation. There are several indirect indicators that may signify the presence of hydric soils including hydrogen sulfide generation, the presence of iron and manganese concretions, certain soil colors, gleying, and the presence of mottling. Generally, hydric soils are dark in color or may be gleyed (bluish, greenish, or grayish), resulting from soil development under anoxic (without oxygen) conditions. Bright mottles within an otherwise dark soil matrix indicate periodic saturation with intervening periods of soil aeration. Hydric indicators are particularly difficult to observe in sandy soils, which are often recently deposited soils of flood plains (entisols) and usually lack sufficient fines (clay and silt) and organic material to allow use of soil color as a reliable indicator of hydric conditions. Hydric soil indicators in sandy soils include accumulations of organic matter in the surface horizon, vertical streaking of subsurface horizons by organic matter, and organic pans.

The hydric soil criterion is satisfied at a location if soils in the area can be inferred or observed to have a high groundwater table, if there is evidence of prolonged soil saturation, or if there are any indicators suggesting a long-term reducing environment in the upper part of the soil profile. Reducing conditions are most easily assessed using soil color. Soil colors were evaluated using the Munsell Soil Color Charts (Munsell 2000). Soil pits are dug (when necessary) to an approximate depth of 16-20 inches to evaluate soil profiles for indications of anaerobic and redoximorphic (hydric) conditions in the subsurface.

- *Wetland Hydrology*: The wetland hydrology criterion is satisfied at a location based upon conclusions inferred from field observations that indicate an area has a high probability of being inundated or saturated (flooded, ponded, or tidally influenced) long enough during the growing season to develop anaerobic conditions in the surface soil environment, especially the root zone (USACE 1987 and USACE 2008).

Evaluation of CDFW jurisdiction followed guidance in the Fish and Game Code and *A Review of Stream Processes and Forms in Dryland Watersheds* (CDFW, 2010). Specifically, CDFW jurisdiction would occur where a stream has a definite course showing evidence of where waters rise to their highest level and to the extent of associated riparian vegetation.

3. Results

3.1 Existing Biological and Physical Conditions

The Project Area consists of the approximately 6.4-acre parcel located on the northwest corner of Central Avenue and Tippecanoe Avenue (Figure 4). The proposed impact area is completely disturbed, consisting of bare ground, and scattered non-native trees. Surrounding land uses consist of existing commercial/industrial development to the north and west, residential development to the south, and San Bernardino International Airport (SBIA) to the east. Human disturbances on site include previous vegetation clearing and disking, litter, and a homeless encampment.

The proposed impact area no longer supports any native habitat. The Project site previously consisted of olive groves; however, the site has been mostly cleared of vegetation and now only supports a few scattered non-native trees (see attached Site Photos). Vegetation in the Project Area is dominated by non-native and ruderal native species including Ailanthus (*Ailanthus altissima*), annual bursage (*Ambrosia acanthicarpa*), jimsonweed (*Datura wrightii*), red stemmed filaree (*Erodium cicutarium*), shortpod mustard (*Hirschfeldia incana*), olive (*Olea europaea*), and Russian thistle (*Salsola tragus*).

Only domestic animals and those wildlife species adapted to an urban environment are expected to occur within the Project Area. The only wildlife species observed or otherwise detected during the reconnaissance-level survey were rock pigeon (*Columba livia*), house finch (*Haemorhous mexicanus*), house sparrow (*Passer domesticus*), European starling (*Sturnus vulgaris*), mourning dove (*Zenaida macroura*), Botta's pocket gopher (*Thomomys bottae*) and western side-blotched lizard (*Uta stansburiana elegans*).

3.2 Special Status Species and Habitats

According to the CNDDB, 72 sensitive species (25 plant species, 47 animal species) and five sensitive habitats have been documented in the *San Bernardino South* and *Redlands* USGS 7.5-Minute Series Quadrangles. This list of sensitive species and habitats includes any state and/or federally listed threatened or endangered species, California Fully Protected species, CDFW designated Species of Special Concern (SSC), and otherwise Special Animals. "Special Animals" is a general term that refers to all the taxa the CNDDB is interested in tracking, regardless of their legal or protection status. This list is also referred to as the list of "species at risk" or "special status species." The CDFW considers the taxa on this list to be those of greatest conservation need.

Of the 20 state and/or federally listed species documented within the *San Bernardino South* and *Redlands* quads, the following three state and/or federally listed species have been documented in the Project vicinity (within approximately 1 mile):

- San Bernardino kangaroo rat (*Dipodomys merriami parvus*)
- Santa Ana River woollystar (*Eriastrum densifolium* ssp. *sanctorum*)
- Least Bell's vireo (*Vireo bellii pusillus*)

Although not a state or federally listed as threatened or endangered species, burrowing owl (*Athene cunicularia*) are considered a state and federal SSC and this species is protected by international treaty under the Migratory Bird Treaty Act (MBTA) of 1918 and by State law under the California FGC (FGC #3513 & #3503.5). Additionally, this species is commonly found in open habitats consisting of short or sparse vegetation and disturbed areas. Therefore, burrowing owl will be included in the discussion below.

3.2.1 Special Status Species

No state and/or federally listed threatened or endangered species, or other sensitive species were observed within the Project Area during the reconnaissance-level field survey and due to the environmental conditions on site, none are expected to occur. An analysis of the likelihood for occurrence of all CNDDB sensitive species documented in the *San Bernardino South* and *Redlands* quads is provided in Appendix A. This analysis considers species' range as well as documentation within the vicinity of the Project site and includes the habitat requirements for each species and the potential for their occurrence on site, based on required habitat elements and range relative to the current site conditions.

Santa Ana River woollystar – Endangered (Federal/State)

The state and federally listed as endangered Santa Ana River woollystar (woollystar) is a short-lived, perennial subshrub of the phlox family (Polemoniaceae). It has a basally branched, generally erect or spreading form, occasionally reaching 1 meter (3.3 feet) in height. The entire plant, including the blue to violet-blue inflorescence, is covered with woolly pubescence, giving it a silvery-white appearance. This woollystar is found in alluvial scrub plant communities along the Santa Ana River and Lytle and Cajon Creek flood plains from the base of the San Bernardino Mountains in San Bernardino County southwest along the Santa Ana River through Riverside County into the Santa Ana Canyon of northeastern Orange County (USFWS 2010). It requires periodic flooding. Associated perennial plants include California croton (*Croton californicus*), California buckwheat (*Eriogonum fasciculatum*), fastigiated golden aster (*Heterotheca sessiliflora* ssp. *fastigiata*), and scale-broom (*Lepidospartum squamatum*). This woollystar typically blooms between May and August but most heavily in June (Muñoz 1991). However, woollystar is readily identifiable throughout the year.

> *Findings*: According to the CNDDB, the nearest documented woolystar occurrence (2021) is approximately 0.3 mile south of the Project site, in suitable alluvial scrub habitat within the Santa Ana River wash. However, the Project Area is not suitable to support woollystar. The habitat this species is associated with (i.e. pioneer and intermediate stage alluvial scrub) is absent from the Project Area and the Project site, which consists of cleared land previously planted with olive groves. Furthermore, this species is readily identifiable throughout the year and no woollystar were observed on site during the pedestrian field survey. Therefore, woollystar are considered absent from the Project Area and the Project will not adversely affect this species.

San Bernardino kangaroo rat – Endangered (Federal)

The federally listed as endangered San Bernardino kangaroo rat (SBKR) is one of three recognized subspecies of Merriam's kangaroo rat (*D. merriami*) in California. The Merriam's kangaroo rat is a small, burrowing rodent species that can be found within inland valleys and deserts of southwest United States of America and northern Mexico. The Dulzura kangaroo rat (*Dipodomys simulans*), the Pacific kangaroo rat (*Dipodomys agilis*) and the Stephens kangaroo rat (*Dipodomys stephensi*) occur in areas occupied by SBKR, but these other species have a wider habitat range. SBKR, however, has a restricted southern California distribution, confined to certain inland valley scrub communities and, more particularly, to scrub communities occurring along rivers, streams, and drainages within the San Bernardino, Menifee, and San Jacinto valleys. Most of these drainages have been historically altered due to a variety of reasons including, mining, off-road vehicle use, road and housing development, and flood control efforts. This increased use of river floodplain resources resulted in a reduction in both the amount and quality of habitat available for SBKR.

The areas which SBKR occupy are subjected to periodic flooding and hence, the dominant vegetation type (alluvial fan sage scrub) is described in general terms as having three successional phases: pioneer, intermediate, and mature as determined by elevation and distance from the main channel and time since previous flooding

(Hanes et al. 1989, p. 187, as cited in USFWS 2009). Vegetation cover generally increases with distance from the active stream channel. The pioneer phase is subject to frequent flood disturbance (Smith 1980, p. 133; Hanes et al. 1989, p. 187, as cited in USFWS 2009). The intermediate phase, defined as the area between the active channel and mature terraces, is subject to periodic flooding at longer intervals. The vegetation on intermediate terraces is relatively open. As alluvial fan scrub vegetation ages in the absence of flooding, the suitability of this habitat for the SBKR declines (McKernan 1997, p. 58, as cited in USFWS 2009).

The USFWS listed SBKR as endangered on September 24, 1998 and set aside 33,295 acres of critical habitat for the SBKR in 2002. The USFWS then revised that decision in 2008 after a lawsuit and cut the designation down to 7,779 acres in Riverside and San Bernardino counties. On January 10, 2011, a federal court struck down the 2008 designation. The ruling concluded that the USFWS improperly relied on "core habitat" to define critical habitat for the SBKR rather than specifying the physical and biological features essential for the kangaroo rat's conservation, as the law requires. The ruling reinstated the 2002 designation. The 2002 critical habitat rule for SBKR defined four Primary Constituent Elements (PCEs) that are essential to the conservation of SBKR. These PCEs are as follows: 1) Soil series consisting predominantly of sand, loamy sand, sandy loam, or loam; 2) Alluvial sage scrub and associated vegetation, such as coastal sage scrub and chamise chaparral, with a moderately open canopy; 3) River, creek, stream, and wash channels; alluvial fans; floodplains; floodplain benches and terraces; and historic braided channels that are subject to dynamic geomorphological and hydrological processes typical of fluvial systems within the historical range of the SBKR; and 4) Upland areas proximal to floodplains with suitable habitat.

> *Findings*: According to the CNDDB, the nearest extant documented SBKR occurrence (2016) is approximately 0.22 mile southeast of the Project site, in suitable alluvial scrub habitat within the Santa Ana River wash. However, the Project Area is not suitable to support SBKR. Although there are loamy sand soils within the Project Area (PCE 1), the plant communities this species typically occurs in (i.e. alluvial scrub and associated vegetation) are absent from the Project Area (PCEs 2 and 4), and the Project Area is no longer subject to the dynamic hydrological processes (PCE 3) typical of the fluvial systems within the historical range of this species. Furthermore, the Project site consists of cleared/disked land previously planted with olive groves and is isolated from any documented SBKR occurrences by existing development. Therefore, SBKR is presumed absent from the Project Area and the Project is not likely to adversely affect this species.

Least Bell's Vireo – Endangered (Federal/State)

The least Bell's vireo (LBVI) is a state and federally listed endangered migratory bird species. This species is a small, olive-gray migratory songbird that nests and forages almost exclusively in riparian woodland habitats. LBVI nesting habitat typically consists of well-developed overstory, understory, and low densities of aquatic and herbaceous cover. The understory frequently contains dense sub-shrub or shrub thickets. These thickets are often dominated by plants such as narrow-leaf willow, mulefat, young individuals of other willow species such as arroyo willow or black willow, and one or more herbaceous species. LBVI generally begin to arrive from their wintering range in southern Baja California and establish breeding territories by mid-March to late-March.

LBVI was first proposed for listing as endangered by the USFWS on May 3, 1985, (50 FR 18968 18975) and was subsequently listed as federally endangered on May 2, 1986 (51 FR 16474 16482). Critical habitat units were designated by the USFWS on February 2, 1994 (59 FR 4845) and included reaches of ten streams in six counties in southern California and the surrounding approximately 38,000 acres.

> *Findings*: According to the CNDDB, the nearest documented LBVI occurrence (2014) is approximately 1 mile southwest of the Project site, in suitable cottonwood-willow riparian habitat within the Santa Ana

River wash. However, there is no riparian habitat within or adjacent the Project Area. Therefore, LBVI is presumed absent from the Project Area and the Project is not likely to adversely affect this species.

Burrowing Owl – SSC

The burrowing owl (BUOW) is a ground dwelling owl typically found in arid prairies, fields, and open areas where vegetation is sparse and low to the ground. The BUOW is heavily dependent upon the presence of mammal burrows, with ground squirrel burrows being a common choice, in its habitat to provide shelter from predators, inclement weather and to provide a nesting place (Coulombe 1971). They are also known to make use of human-created structures, such as cement culverts and pipes, for burrows. According to the definition provided in the *2012 CDFG Staff Report on Burrowing Owl Mitigation*, "Burrowing owl habitat generally includes, but is not limited to, short or sparse vegetation (at least at some time of year), presence of burrows, burrow surrogates or presence of fossorial mammal dens, well-drained soils, and abundant and available prey." BUOW spend a great deal of time standing on dirt mounds at the entrance to a burrow or perched on a fence post or other low to the ground perch from which they hunt for prey. They feed primarily on insects such as grasshoppers, June beetles and moths, but will also take small rodents, birds, and reptiles. They are active during the day and night but are considered a crepuscular owl; generally observed in the early morning hours or at twilight. The breeding season for BUOW is February 1 through August 31.

BUOW have disappeared from significant portions of their range in the last 15 years and, overall, nearly 60 percent of the breeding groups of owls known to have existed in California during the 1980s had disappeared by the early 1990s (Burrowing Owl Consortium 1993). The BUOW is not listed under the state or federal ESAs but is considered both a state and federal SSC. Additionally, the BUOW is a migratory bird protected by the international treaty under the Migratory Bird Treaty Act of 1918 and by State law under the California FGC (FGC #3513 & #3503.5).

Findings: BUOW have not been documented within or adjacent the Project Area. According to the CNDDB, the nearest documented BUOW occurrence (2006) is approximately 1.7 miles northeast of the Project site. The reconnaissance level pedestrian survey included a BUOW habitat suitability assessment survey that was structured, in part, to detect BUOW. The survey included 100 percent visual coverage of any potentially suitable BUOW habitat within and immediately adjacent the Project site.

The result of the survey was that no evidence of BUOW was found in the survey area. Although the vegetation on site is sparse and the soils are well drained, the Project site is surrounded by existing development. No BUOW individuals or sign including castings, feathers or whitewash were observed during survey. Furthermore, no suitably sized burrows, burrow surrogates, or fossorial mammal dens were observed within the Project Area. Therefore, BUOW are considered absent from the Project Area at the time of survey and the Project is not likely to adversely affect this species.

3.2.2 Special Status Habitats

The Project Area does not contain any sensitive habitats, including any USFWS designated Critical Habitat for any federally listed species. The nearest Critical Habitat unit is adjacent the east side of Tippecanoe Avenue, just east of the Project Area. This Critical Habitat unit is part of the Santa Ana River unit (Unit 1) of USFWS designated Critical Habitat for the federally listed as endangered SBKR. However, no portion of the Project Area is within this Critical Habitat unit, or any other sensitive habitats. Therefore, the Project will not result in any loss or adverse modification of USFWS designated Critical Habitat, or any other special status habitats.

3.3 Jurisdictional Delineation

The Project Area is within the Bunker Hill Hydrologic Sub-Area (HSA 801.52). The Bunker Hill HSA comprises a 124,791-acre drainage area, within the larger Santa Ana Watershed (HUC 18070203). This watershed is primarily within San Bernardino County and Riverside Counties, with smaller areas in Orange and Los Angeles Counties. The Santa Ana Watershed is bound on the north by the Mojave and Southern Mojave Watersheds, on the southeast by the Whitewater and San Jacinto Watersheds, and on the west by the San Gabriel, Seal Beach, Newport Bay, and Aliso-San Onofre Watersheds. The Santa Ana Watershed encompasses a portion of the San Gabriel and San Bernardino Mountains in the north, the Santa Ana Mountains in the south, and is approximately 1,694 square miles in area. The Santa Ana River is the major hydrogeomorphic feature within the Santa Ana Watershed. The Santa Ana River flows generally northeast to southwest, approximately 0.21 miles south of the Project site at its closest point.

Waters of the U.S.

The USACE has authority to permit the discharge of dredged or fill material in WOTUS under Section 404 of the CWA. WOTUS are defined as:

> "All waters used in interstate or foreign commerce; all interstate waters including interstate wetlands; all other waters such as intrastate lakes, rivers, streams (including intermittent and ephemeral streams), mudflats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes or natural ponds, where the use, degradation, or destruction of which could affect interstate commerce; impoundments of these waters; tributaries of these waters; or wetlands adjacent to these waters" (Section 404 of the CWA; 33 CFR 328.3 (a).

Therefore, CWA jurisdiction exists over the following:

1. All traditional navigable waters (TNWs);
2. All wetlands adjacent to TNWs;
3. Non-navigable tributaries of TNWs that are relatively permanent waters (RPWs) i.e., tributaries that typically flow year-round or have continuous flow at least seasonally; and
4. Every water body determined to have a significant nexus with TNWs.

Additionally, areas meeting all three wetland parameters would be designated as USACE wetlands, if they are adjacent to jurisdictional WOTUS, or otherwise determined to have a significant nexus to a TNW.

There are no wetland or non-wetland WOTUS within the Project Area. Therefore, the Project will not result in any permanent or temporary impacts to WOTUS.

State Lake/Streambed

There are no lake, river, stream or aquatic resources, stream-dependent wildlife resources or riparian habitats within the Project Area. Therefore, the Project will not result in any permanent or temporary impacts to jurisdictional waters of the State.

4. Conclusions and Recommendations

4.1 Sensitive Biological Resources

No sensitive species were observed within the Project Area during the reconnaissance-level field survey and due to the environmental conditions on site, none are expected to occur. The Project Area is completely disturbed (see attached Site Photos), consisting of consists of cleared/disked land previously planted with olive groves, surrounded by existing commercial/industrial and residential development. The Project Area no longer supports any native habitats that would be suitable to support any of the state or federally listed species, or other special status species documented in the Project vicinity. Therefore, the proposed Project is not likely to adversely affect any state or federally listed species, or other special status species, and the potential for any of the sensitive species identified in Appendix A to occur within the Project Area is low or low to moderate. Furthermore, although the Project Area is adjacent USFWS designated Critical Habitat for the federally listed SBKR, the Project will not result in any loss or adverse modification of Critical Habitat.

Burrowing Owl

A BUOW habitat suitability assessment was conducted by Jacobs biologists in September 2021 that included 100 percent visual coverage of the Project Area, wherever potentially suitable BUOW habitat was present. The result of the survey was that no evidence of BUOW was found in the survey area. No BUOW individuals or sign including castings, feathers or whitewash were observed and BUOW are considered absent from the Project Area at the time of survey. Although the Project is not likely to adversely affect this species, there is still a potential for the Project Area to become occupied by BUOW between the time the survey was conducted and the commencement of Project-related construction activities. Therefore, the following precautionary avoidance measures are recommended to ensure the Project does not result in any impacts to BUOW:

- Pre-construction surveys for BUOW should be conducted no more than 3 days prior to commencement of Project-related ground disturbance to verify that BUOW remain absent from the Project Area.

The BUOW is a state and federal SSC and is also protected under the MBTA and by state law under the California FGC (FGC #3513 & #3503.5). In general, impacts to BUOW can be avoided by conducting work outside of their nesting season (peak BUOW breeding season is identified as April 15th to August 15th). However, if all work cannot be conducted outside of nesting season, a project specific BUOW protection and/or passive relocation plan can be prepared to determine suitable buffers and/or artificial burrow construction locations. Regardless of survey results and conclusions given herein, BUOW are protected by applicable state and federal laws. As such, if a BUOW is found on-site at the time of construction, all activities likely to affect the animal(s) should cease immediately and regulatory agencies should be contacted to determine appropriate management actions. Importantly, nothing given in this report is intended to authorize any form of disturbance to BUOW. Such authorization must come from the appropriate regulatory agencies, including CDFW and/or USFWS.

Nesting Birds

There is habitat within the Project Area that is suitable to support nesting birds, including both vegetation and man-made structures. Most native bird species are protected from unlawful take by the MBTA (Appendix C). In December 2017, the Department of the Interior (DOI) issued a memorandum concluding that the MBTA's prohibitions on take apply "[…] only to affirmative actions that have as their purpose the taking or killing of migratory birds, their nests, or their eggs" (DOI 2017). Then in April 2018, the USFWS issued a guidance memorandum that further clarified that the take of migratory birds or their active nests (i.e., with eggs or young) that is incidental to, and not the purpose of, an otherwise lawful activity does not constitute a violation of the MBTA (USFWS 2018).

However, the State of California provides additional protection for native bird species and their nests in the FGC (Appendix C). Bird nesting protections in the FGC include the following (Sections 3503, 3503.5, 3511, 3513 and 3800):

- Section 3503 prohibits the take, possession, or needless destruction of the nest or eggs of any bird.
- Section 3503.5 prohibits the take, possession, or needless destruction of any nests, eggs, or birds in the orders Falconiformes (new world vultures, hawks, eagles, ospreys, and falcons, among others), and Strigiformes (owls).
- Section 3511 prohibits the take or possession of Fully Protected birds.
- Section 3513 prohibits the take or possession of any migratory nongame bird or part thereof, as designated in the MBTA. To avoid violation of the take provisions, it is generally required that Project-related disturbance at active nesting territories be reduced or eliminated during the nesting cycle.
- Section 3800 prohibits the take of any any non-game bird (i.e., bird that is naturally occurring in California that is not a gamebird, migratory game bird, or fully protected bird).

In general, impacts to all bird species (common and special status) can be avoided by conducting work outside of the nesting season, which is generally February 1st through August 31st. However, if all work cannot be conducted outside of nesting season, the following is recommended:

- Ø To avoid impacts to nesting birds (common and special status) during the nesting season, a qualified Avian Biologist should conduct pre-construction nesting bird surveys no more than 3 days prior to Project-related disturbance to suitable nesting areas to identify any active nests. If no active nests are found, no further action would be required. If an active nest is found, the biologist should set appropriate no-work buffers around the nest which would be based upon the nesting species, its sensitivity to disturbance, nesting stage and expected types, intensity, and duration of disturbance. The nest(s) and buffer zones should be field checked weekly by a qualified biological monitor. The approved no-work buffer zone should be clearly marked in the field, within which no disturbance activity should commence until the qualified biologist has determined the young birds have successfully fledged and the nest is inactive.

4.2 Jurisdictional Waters

In addition to the BRA, Jacobs also assessed the Project Area for the presence of any state and/or federal jurisdictional waters. The result of the jurisdictional waters assessment is that there are no wetland or non-wetland WOTUS or waters of the State potentially subject to regulation by the USACE under Section 404 of the CWA, the RWQCB under Section 401 of the CWA and/or Porter Cologne Water Quality Control Act, or the CDFW under Section 1602 of the California FGC, respectively. Therefore, the Project will not impact any jurisdictional waters and no state or federal jurisdictional waters permitting will be required.

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Appendix A. CNDDB Species and Habitats Documented Within the *San Bernardino South* and *Redlands* USGS 7.5-Minute Quadrangles

Special Status Species Occurrence Potential Analysis

Scientific Name	Common Name	Listing Status Federal / State	Other Status	Habitat	Occurrence Potential
Accipiter cooperii	Cooper's hawk	None / None	G5; S4; CDFW: WL	Woodland, chiefly of open, interrupted, or marginal type. Nest sites mainly in riparian growths of deciduous trees, as in canyon bottoms on river floodplains; also, live oaks.	The olive trees present on site provide only marginally suitable nesting habitat for this species. Occurrence potential is low.
Agelaius tricolor	tricolored blackbird	None / Threatened	G1G2; S1S2; CDFW: SSC	Highly colonial species, most numerous in Central Valley and vicinity. Largely endemic to California. Requires open water, protected nesting substrate, and foraging area with insect prey within a few km of the colony.	No suitable habitat for this species exists in the Project Area. Occurrence potential is low.
Aimophila ruficeps canescens	southern California rufous-crowned sparrow	None / None	G5T3; S3; CDFW: WL	Resident in Southern California coastal sage scrub and sparse mixed chaparral. Frequents relatively steep, often rocky hillsides with grass and forb patches.	No suitable habitat for this species exists in the Project Area. Occurrence potential is low.
Anniella stebbinsi	Southern California legless lizard	None / None	G3; S3; CDFW: SSC	Generally south of the Transverse Range, extending to northwestern Baja California. Occurs in sandy or loose loamy soils under sparse vegetation. Disjunct populations in the Tehachapi and Piute Mountains in Kern County. Variety of habitats; generally, in moist, loose soil. They prefer soils with a high moisture content.	The habitat on site likely only marginally suitable to support this species, given that the ground is almost entirely exposed and the surface soil id very dry. Occurrence potential is low.
Antrozous pallidus	pallid bat	None / None	G4; S3; CDFW: SSC	Deserts, grasslands, shrublands, woodlands and forests. Most common in open, dry habitats with rocky areas for roosting. Roosts must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.	There are no suitable roost sites for this species on the Project site. Occurrence potential is low.

Scientific Name	Common Name	Listing Status Federal/ State	Other Status	Habitat	Occurrence Potential
Arenaria paludicola	marsh sandwort	Endangered/ Endangered	G1; S1; CNPS: 1B.1	Marshes and swamps. Growing up through dense mats of *Typha, Juncus, Scirpus*, etc. in freshwater marsh. Sandy soil. 3-170 m.	The habitats and mesic conditions this species is associated with are absent from the Project Area. Occurrence potential is low.
Arizona elegans occidentalis	California glossy snake	None/ None	G5T2; S2; CDFW: SSC	Patchily distributed from the eastern portion of San Francisco Bay, southern San Joaquin Valley, and the Coast, Transverse, and Peninsular ranges, south to Baja California. Generalist reported from a range of scrub and grassland habitats, often with loose or sandy soils.	The habitat on site likely only marginally suitable to support this species, given that the site has been mostly cleared of vegetation and is subject to a significant level of human disturbance. Occurrence potential is low.
Artemisiospiza belli belli	Bell's sage sparrow	None/ None	G5T2T3; S3; CDFW: WL	Nests in chaparral dominated by fairly dense stands of chamise. Found in coastal sage scrub in south of range. Nest located on the ground beneath a shrub or in a shrub 6-18 inches above ground. Territories about 50 yds apart.	No suitable habitat for this species exists in the Project Area. Occurrence potential is low.
Aspidoscelis hyperythra	orange-throated whiptail	None/ None	G5; S2S3; CDFW: WL	Inhabits low-elevation coastal scrub, chaparral, and valley-foothill hardwood habitats. Prefers washes and other sandy areas with patches of brush and rocks. Perennial plants necessary for its major food: termites.	No suitable habitat for this species exists in the Project Area. Occurrence potential is low.
Aspidoscelis tigris stejnegeri	coastal whiptail	None/ None	G5T5; S3; CDFW: SSC	Found in deserts and semi-arid areas with sparse vegetation and open areas. Also found in woodland and riparian areas. Ground may be firm soil, sandy, or rocky.	No suitable habitat for this species exists in the Project Area. Occurrence potential is low.
Astragalus hornii var. *hornii*	Horn's milk-vetch	None/ None	GUT1; S1; CNPS: 1B.1	Meadows and seeps, playas. Lake margins, alkaline sites. 75-350 m.	The habitats this species is associated with are absent from the Project Area. Occurrence potential is low.

Scientific Name	Common Name	Listing Status Federal/ State	Other Status	Habitat	Occurrence Potential
Athene cunicularia	burrowing owl	None/ None	G4; S3; CDFW: SSC	Open, dry annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel.	Although there is potentially suitable habitat for this species in the Project Area, this species is absent from the Project site.
Berberis nevinii	Nevin's barberry	Endangered/ Endangered	G1; S1; CNPS: 1B.1	Chaparral, cismontane woodland, coastal scrub, riparian scrub. On steep, N-facing slopes or in low grade sandy washes. 90-1590 m.	The habitats this species is associated with are absent from the Project Area. Occurrence potential is low.
Bombus crotchii	Crotch bumble bee	None/ None	G3G4; S1S2	Coastal California east to the Sierra-Cascade crest and south into Mexico. Food plant genera include *Antirrhinum*, *Phacelia*, *Clarkia*, *Dendromecon*, *Eschscholzia*, and *Eriogonum*.	The food plant genera required by this species are absent from the Project Area. Occurrence potential is low.
Buteo swainsoni	Swainson's hawk	None/ Threatened	G5; S3	Breeds in grasslands with scattered trees, juniper-sage flats, riparian areas, savannahs, and agricultural or ranch lands with groves or lines of trees. Requires adjacent suitable foraging areas such as grasslands, or alfalfa or grain fields supporting rodent populations.	No suitable habitat for this species exists in the Project Area. Occurrence potential is low.
Calochortus plummerae	Plummer's mariposa-lily	None/ None	G4; S4; CNPS: 4.2	Coastal scrub, chaparral, valley and foothill grassland, cismontane woodland, lower montane coniferous forest. Occurs on rocky and sandy sites, usually of granitic or alluvial material. Can be very common after fire. 60-2500 m.	The habitats this species is associated with are absent from the Project Area. Occurrence potential is low.
Carex comosa	bristly sedge	None/ None	G5; S2; CNPS: 2B.1	Marshes and swamps, coastal prairie, valley and foothill grassland. Lake margins, wet places; site below sea level is on a Delta island. -5-1010 m.	The habitats and mesic conditions this species is associated with are absent from the Project Area. Occurrence potential is low.

Scientific Name	Common Name	Listing Status Federal/ State	Other Status	Habitat	Occurrence Potential
Catostomus santaanae	Santa Ana sucker	Threatened/ None	G1; S1	Endemic to Los Angeles Basin south coastal streams. Habitat generalists, but prefer sand-rubble-boulder bottoms, cool, clear water, and algae.	The aquatic habitats this species requires are absent from the Project Area. Therefore, this species is considered absent from the Project Area.
Centromadia pungens ssp. *laevis*	smooth tarplant	None/ None	G3G4T2; S2; CNPS: 1B.1	Valley and foothill grassland, chenopod scrub, meadows and seeps, playas, riparian woodland. Alkali meadow, alkali scrub; also, in disturbed places. 5-1170 m.	The habitats this species is associated with are absent from the Project Area. Occurrence potential is low.
Chaetodipus fallax fallax	northwestern San Diego pocket mouse	None/ None	G5T3T4; S3S4; CDFW: SSC	Coastal scrub, chaparral, grasslands, sagebrush, etc. in western San Diego County. Sandy, herbaceous areas, usually in association with rocks or coarse gravel.	No suitable habitat for this species exists in the Project Area. Occurrence potential is low.
Chloropyron maritimum ssp. *maritimum*	salt marsh bird's-beak	Endangered/ Endangered	G4?T1; S1; CNPS: 1B.2	Marshes and swamps, coastal dunes. Limited to the higher zones of salt marsh habitat. 0-10 m.	The habitats and mesic conditions this species is associated with are absent from the Project Area. Occurrence potential is low.
Chorizanthe parryi var. *parryi*	Parry's spineflower	None/ None	G3T2; S2; CNPS: 1B.1	Coastal scrub, chaparral, cismontane woodland, valley and foothill grassland. Dry slopes and flats; sometimes at interface of 2 vegetation types, such as chaparral and oak woodland. Dry, sandy soils. 90-1220 m.	The habitats this species is associated with are absent from the Project Area. Occurrence potential is low.
Coccyzus americanus occidentalis	western yellow-billed cuckoo	Threatened/ Endangered	G5T2T3; S1	Riparian forest nester, along the broad, lower flood-bottoms of larger river systems. Nests in riparian jungles of willow, often mixed with cottonwoods, with lower story of blackberry, nettles, or wild grape.	No suitable riparian habitat for this species exists in the Project Area. Occurrence potential is low.
Coleonyx variegatus abbotti	San Diego banded gecko	None/ None	G5T5; S1S2; CDFW: SSC	Coastal and cismontane Southern California. Found in granite or rocky outcrops in coastal scrub and chaparral habitats.	No suitable habitat for this species exists in the Project Area. Occurrence potential is low.

Scientific Name	Common Name	Listing Status Federal/ State	Other Status	Habitat	Occurrence Potential
Crotalus ruber	red-diamond rattlesnake	None/ None	G4; S3; CDFW: SSC	Chaparral, woodland, grassland, and desert areas from coastal San Diego County to the eastern slopes of the mountains. Occurs in rocky areas and dense vegetation. Needs rodent burrows, cracks in rocks or surface cover objects.	No suitable habitat for this species exists in the Project Area. Occurrence potential is low.
Cuscuta obtusiflora var. *glandulosa*	Peruvian dodder	None/ None	G5T4?; SH; CNPS: 2B.2	Marshes and swamps (freshwater). Freshwater marsh. 15-280 m.	The habitats and mesic conditions this species is associated with are absent from the Project Area. Occurrence potential is low.
Dipodomys merriami parvus	San Bernardino kangaroo rat	Endangered/ Candidate Endangered	G5T1; S1; CDFW: SSC	Alluvial scrub vegetation on sandy loam substrates characteristic of alluvial fans and flood plains. Needs early to intermediate seral stages.	No suitable habitat for this species exists in the Project Area. Occurrence potential is low.
Dipodomys stephensi	Stephens' kangaroo rat	Endangered/ Threatened	G2; S2	Primarily annual and perennial grasslands, but also occurs in coastal scrub and sagebrush with sparse canopy cover. Prefers buckwheat, chamise, brome grass and filaree. Will burrow into firm soil.	No suitable habitat for this species exists in the Project Area. Occurrence potential is low.
Dodecahema leptoceras	slender-horned spineflower	Endangered/ Endangered	G1; S1; CNPS: 1B.1	Chaparral, cismontane woodland, coastal scrub (alluvial fan sage scrub). Flood deposited terraces and washes; associates include *Encelia, Dalea, Lepidospartum*, etc. Sandy soils. 200-765 m.	The habitats this species is associated with are absent from the Project Area. Occurrence potential is low.
Empidonax traillii extimus	southwestern willow flycatcher	Endangered/ Endangered	G5T2; S1	Riparian woodlands in Southern California.	No suitable riparian habitat for this species exists in the Project Area. Occurrence potential is low.
Eremophila alpestris actia	California horned lark	None/ None	G5T4Q; S4; CDFW: WL	Coastal regions, chiefly from Sonoma County to San Diego County. Also, main part of San Joaquin Valley and east to foothills. Short-grass prairie, "bald" hills, mountain meadows, open coastal plains, fallow grain fields, alkali flats.	The Project Area is marginally suitable to support this species. Occurrence potential is low-moderate.

Scientific Name	Common Name	Listing Status Federal/ State	Other Status	Habitat	Occurrence Potential
Eriastrum densifolium ssp. *sanctorum*	Santa Ana River woollystar	Endangered/ Endangered	G4T1; S1; CNPS: 1B.1	Coastal scrub, chaparral. In sandy soils on river floodplains or terraced fluvial deposits. 180-705 m.	The habitats this species is associated with are absent from the Project Area. Occurrence potential is low.
Eugnosta busckana	Busck's gallmoth	None/ None	G1G3; SH		Occurrence potential is unknown.
Eumops perotis californicus	western mastiff bat	None/ None	G4G5T4; S3S4; CDFW: SSC	Many open, semi-arid to arid habitats, including conifer and deciduous woodlands, coastal scrub, grasslands, chaparral, etc. Roosts in crevices in cliff faces, high buildings, trees, and tunnels.	There are limited roost sites for this species on the Project site, which is subject to a significant level of human disturbance. Occurrence potential is low.
Euphydryas editha quino	quino checkerspot butterfly	Endangered/ None	G5T1T2; S1S2	Sunny openings within chaparral and coastal sage shrublands in parts of Riverside and San Diego counties. Hills and mesas near the coast. Need high densities of food plants *Plantago erecta, P. insularis,* and *Orthocarpus purpurescens*.	The food plant species required by this species are absent from the Project Area. Occurrence potential is low.
Falco columbarius	merlin	None/ None	G5; S3S4; CDFW: WL	Seacoast, tidal estuaries, open woodlands, savannahs, edges of grasslands and deserts, farms, and ranches. Clumps of trees or windbreaks are required for roosting in open country.	The olive trees present on site provide only marginally suitable nesting habitat for this species. Occurrence potential is low.
Galium californicum ssp. *primum*	Alvin Meadow bedstraw	None/ None	G5T2; S2; CNPS: 1B.2	Chaparral, lower montane coniferous forest. Grows in shade of trees and shrubs at the lower edge of the pine belt, in pine forest-chaparral ecotone. Granitic, sandy soils. 1460-1830 m.	The Project Area is outside the known elevation range for this species and the habitats this species is associated with are absent from the Project Area. Occurrence potential is low.
Gila orcuttii	arroyo chub	None/ None	G2; S2; CDFW: SSC	Native to streams from Malibu Creek to San Luis Rey River basin. Introduced into streams in Santa Clara, Ventura, Santa Ynez, Mojave, and San Diego river basins. Slow water stream sections with mud or sand bottoms. Feeds heavily on aquatic vegetation and associated invertebrates.	The aquatic habitats this species requires are absent from the Project Area. Therefore, this species is considered absent from the Project Area.

Scientific Name	Common Name	Listing Status Federal/ State	Other Status	Habitat	Occurrence Potential
Helianthus nuttallii ssp. *parishii*	Los Angeles sunflower	None/ None	G5TX; SX; CNPS: 1A	Marshes and swamps (coastal salt and freshwater). 35-1525 m.	The habitats and mesic conditions this species is associated with are absent from the Project Area. Occurrence potential is low.
Horkelia cuneata var. *puberula*	mesa horkelia	None/ None	G4T1; S1; CNPS: 1B.1	Chaparral, cismontane woodland, coastal scrub. Sandy or gravelly sites. 15-1645 m.	The habitats this species is associated with are absent from the Project Area. Occurrence potential is low.
Icteria virens	yellow-breasted chat	None/ None	G5; S3; CDFW: SSC	Summer resident; inhabits riparian thickets of willow and other brushy tangles near watercourses. Nests in low, dense riparian, consisting of willow, blackberry, wild grape; forages and nests within 10 ft. of ground.	No suitable riparian habitat for this species exists in the Project Area. Occurrence potential is low.
Imperata brevifolia	California satintail	None/ None	G4; S3; CNPS: 2B.1	Coastal scrub, chaparral, riparian scrub, Mojavean Desert scrub, meadows, and seeps (alkali), riparian scrub. Mesic sites, alkali seeps, riparian areas. 3-1495 m.	The habitats and mesic conditions this species is associated with are absent from the Project Area. Occurrence potential is low.
Lanius ludovicianus	loggerhead shrike	None/ None	G4; S4; CDFW: SSC	Broken woodlands, savannah, pinyon-juniper, Joshua tree, and riparian woodlands, desert oases, scrub, and washes. Prefers open country for hunting, with perches for scanning, and fairly dense shrubs and brush for nesting.	No suitable nesting habitat for this species exists in the Project Area. Occurrence potential is low.
Lasiurus xanthinus	western yellow bat	None/ None	G4G5; S3; CDFW: SSC	Found in valley foothill riparian, desert riparian, desert wash, and palm oasis habitats. Roosts in trees, particularly palms. Forages over water and among trees.	There are limited roost sites for this species on the Project site, which is subject to a significant level of human disturbance. Occurrence potential is low.
Laterallus jamaicensis coturniculus	California black rail	None/ Threatened	G3G4T1; S1; CDFW: FP	Inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. Needs water depths of about 1 inch that do not fluctuate during the year and dense vegetation for nesting habitat.	No suitable marsh habitat for this species exists in the Project Area. Occurrence potential is low.

Scientific Name	Common Name	Listing Status Federal/ State	Other Status	Habitat	Occurrence Potential
Lepidium virginicum var. *robinsonii*	Robinson's peppergrass	None/ None	G5T3; S3; CNPS: 4.3	Chaparral, coastal scrub. Dry soils, shrubland. 4-1435 m.	The habitats this species is associated with are absent from the Project Area. Occurrence potential is low.
Lepus californicus bennettii	San Diego black-tailed jackrabbit	None/ None	G5T3T4; S3S4; CDFW: SSC	Intermediate canopy stages of shrub habitats and open shrub / herbaceous and tree / herbaceous edges. Coastal sage scrub habitats in Southern California.	No suitable habitat for this species exists in the Project Area. Occurrence potential is low.
Lycium parishii	Parish's desert-thorn	None/ None	G4; S1; CNPS: 2B.3	Coastal scrub, Sonoran Desert scrub. -3-570 m.	The habitats this species is associated with are absent from the Project Area. Occurrence potential is low.
Malacothamnus parishii	Parish's bush-mallow	None/ None	GXQ; SX; CNPS: 1A	Chaparral, coastal sage scrub. In a wash. 305-455 m.	The habitats this species is associated with are absent from the Project Area. Occurrence potential is low.
Monardella pringlei	Pringle's monardella	None/ None	GX; SX; CNPS: 1A	Coastal scrub. Sandy hills. 300-400 m.	The habitats this species is associated with are absent from the Project Area. Occurrence potential is low.
Nasturtium gambelii	Gambel's water cress	Endangered/ Threatened	G1; S1; CNPS: 1B.1	Marshes and swamps. Freshwater and brackish marshes at the margins of lakes and along streams, in or just above the water level. 5-305 m.	The habitats and mesic conditions this species is associated with are absent from the Project Area. Occurrence potential is low.
Neolarra alba	white cuckoo bee	None/ None	GH; SH	Known only from localities in Southern California. Cleptoparasitic in the nests of perdita bees.	Occurrence potential is unknown.
Neotoma lepida intermedia	San Diego desert woodrat	None/ None	G5T3T4; S3S4; CDFW: SSC	Coastal scrub of Southern California from San Diego County to San Luis Obispo County. Moderate to dense canopies preferred. They are particularly abundant in rock outcrops, rocky cliffs, and slopes.	No suitable habitat for this species exists in the Project Area. Occurrence potential is low.

Scientific Name	Common Name	Listing Status Federal/ State	Other Status	Habitat	Occurrence Potential
Nyctinomops femorosaccus	pocketed free-tailed bat	None/ None	G5; S3; CDFW: SSC	Variety of arid areas in Southern California; pine-juniper woodlands, desert scrub, palm oasis, desert wash, desert riparian, etc. Rocky areas with high cliffs.	There are no suitable roost sites for this species on the Project site, which is subject to a significant level of human disturbance. Occurrence potential is low.
Oncorhynchus mykiss irideus pop. 10	steelhead - southern California DPS	Endangered/ None	G5T1Q; S1	Federal listing refers to populations from Santa Maria River south to southern extent of range (San Mateo Creek in San Diego County). Southern steelhead likely have greater physiological tolerances to warmer water and more variable conditions.	The aquatic habitats this species requires are absent from the Project Area. Therefore, this species is considered absent from the Project Area.
Onychomys torridus ramona	southern grasshopper mouse	None/ None	G5T3; S3; CDFW: SSC	Desert areas, especially scrub habitats with friable soils for digging. Prefers low to moderate shrub cover. Feeds almost exclusively on arthropods, especially scorpions and orthopteran insects.	No suitable habitat for this species exists in the Project Area. Occurrence potential is low.
Perognathus longimembris brevinasus	Los Angeles pocket mouse	None/ None	G5T2; S1S2; CDFW: SSC	Lower elevation grasslands and coastal sage communities in and around the Los Angeles Basin. Open ground with fine, sandy soils. May not dig extensive burrows, hiding under weeds and dead leaves instead.	No suitable habitat for this species exists in the Project Area. Occurrence potential is low.
Phrynosoma blainvillii	coast horned lizard	None/ None	G3G4; S3S4; CDFW: SSC	Frequents a wide variety of habitats, most common in lowlands along sandy washes with scattered low bushes. Open areas for sunning, bushes for cover, patches of loose soil for burial, and abundant supply of ants and other insects.	No suitable habitat for this species exists in the Project Area. Occurrence potential is low.
Polioptila californica californica	coastal California gnatcatcher	Threatened/ None	G4G5T3Q; S2; CDFW: SSC	Obligate, permanent resident of coastal sage scrub below 2500 ft in Southern California. Low, coastal sage scrub in arid washes, on mesas and slopes. Not all areas classified as coastal sage scrub are occupied.	No suitable habitat for this species exists in the Project Area. Occurrence potential is low.

Scientific Name	Common Name	Listing Status Federal/ State	Other Status	Habitat	Occurrence Potential
Rana muscosa	southern mountain yellow-legged frog	Endangered/ Endangered	G1; S1; CDFW: WL	Federal listing refers to populations in the San Gabriel, San Jacinto, and San Bernardino mountains (southern DPS). Northern DPS was determined to warrant listing as endangered, Apr 2014, effective Jun 30, 2014. Always encountered within a few feet of water. Tadpoles may require 2 - 4 yrs. to complete their aquatic development.	The aquatic habitats this species requires are absent from the Project Area. Therefore, this species is considered absent from the Project Area.
Rhaphiomidas terminatus abdominalis	Delhi Sands flower-loving fly	Endangered/ None	G1T1; S1	Found only in areas of the Delhi Sands formation in southwestern San Bernardino and northwestern Riverside counties. Requires fine, sandy soils, often with wholly or partly consolidated dunes and sparse vegetation. Oviposition requires shade.	The soil type and food plants this species is associated with are absent from the Project site. Occurrence potential is low.
Rhinichthys osculus ssp. 8	Santa Ana speckled dace	None/ None	G5T1; S1; CDFW: SSC	Headwaters of the Santa Ana and San Gabriel rivers. May be extirpated from the Los Angeles River system. Requires permanent flowing streams with summer water temps of 17-20 C. Usually inhabits shallow cobble and gravel riffles.	The aquatic habitats this species requires are absent from the Project Area. Therefore, this species is considered absent from the Project Area.
Ribes divaricatum var. *parishii*	Parish's gooseberry	None/ None	G5TX; SX; CNPS: 1A	Riparian woodland. Salix swales in riparian habitats. 65-300 m.	The habitats this species is associated with are absent from the Project Area. Occurrence potential is low.
Riversidian Alluvial Fan Sage Scrub	Riversidian Alluvial Fan Sage Scrub	None/ None	G1; S1.1		This habitat is absent from the Project Area.
Senecio aphanactis	chaparral ragwort	None/ None	G3; S2; CNPS: 2B.2	Chaparral, cismontane woodland, coastal scrub. Drying alkaline flats. 20-1020 m.	The habitats this species is associated with are absent from the Project Area. Occurrence potential is low.

Scientific Name	Common Name	Listing Status Federal/ State	Other Status	Habitat	Occurrence Potential
Setophaga petechia	yellow warbler	None/ None	G5; S3S4; CDFW: SSC	Riparian plant associations in close proximity to water. Also nests in montane shrubbery in open conifer forests in Cascades and Sierra Nevada. Frequently found nesting and foraging in willow shrubs and thickets, and in other riparian plants including cottonwoods, sycamores, ash, and alders.	No suitable riparian habitat for this species exists in the Project Area. Occurrence potential is low.
Sidalcea neomexicana	salt spring checkerbloom	None/ None	G4; S2; CNPS: 2B.2	Playas, chaparral, coastal scrub, lower montane coniferous forest, Mojavean Desert scrub. Alkali springs and marshes. 3-2380 m.	The habitats and mesic conditions this species is associated with are absent from the Project Area. Occurrence potential is low.
Southern Coast Live Oak Riparian Forest	Southern Coast Live Oak Riparian Forest	None/ None	G4; S4		This habitat is absent from the Project Area.
Southern Cottonwood Willow Riparian Forest	Southern Cottonwood Willow Riparian Forest	None/ None	G3; S3.2		This habitat is absent from the Project Area.
Southern Riparian Scrub	Southern Riparian Scrub	None/ None	G3; S3.2		This habitat is absent from the Project Area.
Southern Sycamore Alder Riparian Woodland	Southern Sycamore Alder Riparian Woodland	None/ None	G4; S4		This habitat is absent from the Project Area.
Spea hammondii	western spadefoot	None/ None	G2G3; S3; CDFW: SSC	Occurs primarily in grassland habitats but can be found in valley-foothill hardwood woodlands. Vernal pools are essential for breeding and egg-laying.	The aquatic habitats this species requires are absent from the Project Area. Therefore, this species is considered absent from the Project Area.
Sphenopholis obtusata	prairie wedge grass	None/ None	G5; S2; CNPS: 2B.2	Cismontane woodland, meadows, and seeps. Open moist sites, along rivers and springs, alkaline desert seeps. 15-2625 m.	The habitats and mesic conditions this species is associated with are absent from the Project Area. Occurrence potential is low.

Scientific Name	Common Name	Listing Status Federal/ State	Other Status	Habitat	Occurrence Potential
Symphyotrichum defoliatum	San Bernardino aster	None/ None	G2; S2; CNPS: 1B.2	Meadows and seeps, cismontane woodland, coastal scrub, lower montane coniferous forest, marshes and swamps, valley and foothill grassland. Vernally mesic grassland or near ditches, streams, and springs; disturbed areas. 3-2045 m.	The habitats and mesic conditions this species is associated with are absent from the Project Area. Occurrence potential is low.
Taxidea taxus	American badger	None/ None	G5; S3; CDFW: SSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils. Needs sufficient food, friable soils, and open, uncultivated ground. Preys on burrowing rodents. Digs burrows.	No suitable habitat for this species exists in the Project Area. Occurrence potential is low.
Thamnophis hammondii	two-striped gartersnake	None/ None	G4; S3S4; CDFW: SSC	Coastal California from vicinity of Salinas to northwest Baja California. From sea to about 7,000 ft elevation. Highly aquatic, found in or near permanent fresh water. Often along streams with rocky beds and riparian growth.	The aquatic habitats this species requires are absent from the Project Area. Therefore, this species is considered absent from the Project Area.
Vireo bellii pusillus	least Bell's vireo	Endangered/ Endangered	G5T2; S2	Summer resident of Southern California in low riparian in vicinity of water or in dry river bottoms; below 2,000 ft. Nests placed along margins of bushes or on twigs projecting into pathways, usually willow, Baccharis, mesquite.	No suitable riparian habitat for this species exists in the Project Area. Occurrence potential is low.

Coding and Terms

E = Endangered T = Threatened C = Candidate FP = Fully Protected SSC = Species of Special Concern R = Rare

State Species of Special Concern: An administrative designation given to vertebrate species that appear to be vulnerable to extinction because of declining populations, limited acreages, and/or continuing threats. Raptor and owls are protected under section 3502.5 of the California Fish and Game code: "It is unlawful to take, possess or destroy any birds in the orders Falconiformes or Strigiformes or to take, possess or destroy the nest or eggs of any such bird."

State Fully Protected: The classification of Fully Protected was the State's initial effort in the 1960's to identify and provide additional protection to those animals that were rare or faced possible extinction. Lists were created for fish, mammals, amphibians and reptiles. Fully Protected species may not be taken or possessed at any time and no licenses or permits may be issued for their take except for collecting these species for necessary scientific research and relocation of the bird species for the protection of livestock.

Global Rankings (Species or Natural Community Level):
G1 = Critically Imperiled – At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2 = Imperiled – At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3 = Vulnerable – At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4 = Apparently Secure – Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5 = Secure – Common; widespread and abundant.

Subspecies Level: Taxa which are subspecies or varieties receive a taxon rank (T-rank) attached to their G-rank. Where the G-rank reflects the condition of the entire species, the T-rank reflects the global situation of just the subspecies. For example: the Point Reyes mountain beaver, *Aplodontia rufa* ssp. *phaea* is ranked G5T2. The G-rank refers to the whole species range i.e., *Aplodontia rufa*. The T-rank refers only to the global condition of ssp. *phaea*.

State Ranking:
S1 = Critically Imperiled – Critically imperiled in the State because of extreme rarity (often 5 or fewer populations) or because of factor(s) such as very steep declines making it especially vulnerable to extirpation from the State.
S2 = Imperiled – Imperiled in the State because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the State.
S3 = Vulnerable – Vulnerable in the State due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation from the State.
S4 = Apparently Secure – Uncommon but not rare in the State; some cause for long-term concern due to declines or other factors.
S5 = Secure – Common, widespread, and abundant in the State.

California Rare Plant Rankings (CNPS List):
1A = Plants presumed extirpated in California and either rare or extinct elsewhere.
1B = Plants rare, threatened, or endangered in California and elsewhere.
2A = Plants presumed extirpated in California, but common elsewhere.
2B = Plants rare, threatened, or endangered in California, but more common elsewhere.
3 = Plants about which more information is needed; a review list.
4 = Plants of limited distribution; a watch list.

Threat Ranks:
.1 = Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat)
.2 = Moderately threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat)
.3 = Not very threatened in California (less than 20% of occurrences threatened / low degree and immediacy of threat or no current threats known)

Appendix B. Site Photos

	Photo 1. Southeast corner of Project site; looking west along southern boundary of the site. E Central Avenue on the left.
	Photo 2. Southeast corner of Project site; looking north along eastern boundary of the site. S Tippecanoe Avenue on the right.

	Photo 3. Northeast corner of Project site; looking south along eastern boundary of the site. S Tippecanoe Avenue on the left.
	Photo 4. Northeast corner of Project site; looking west along northern boundary of the site.

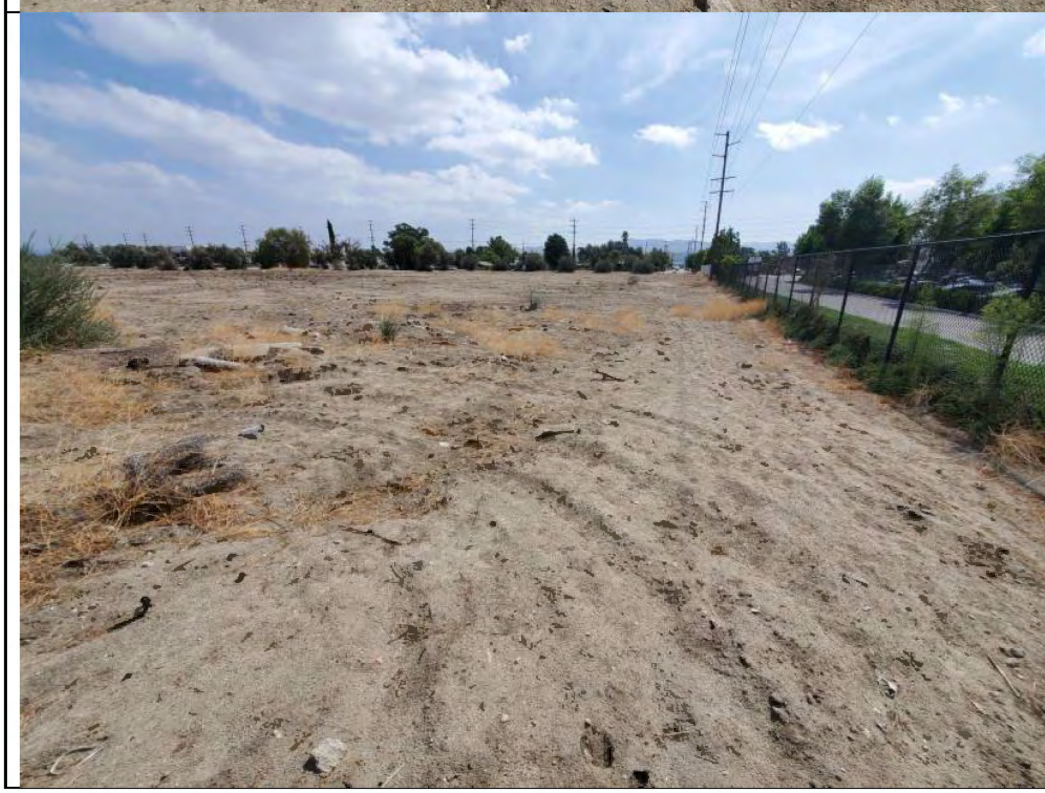
	Photo 5. Northwest corner of Project site; looking east along northern boundary of the site.
	Photo 6. Northwest corner of Project site; looking south along western boundary of the site.

	Photo 7. Southwest corner of Project site; looking north along western boundary of the site.
	Photo 8. Southwest corner of Project site; looking east along southern boundary of the site. E Central Avenue on the right.

Appendix C. Regulatory Framework

Federal Regulations

Clean Water Act

The purpose of the Clean Water Act (CWA) of 1977 is to "restore and maintain the chemical, physical, and biological integrity of the nation's waters." Section 404 of the CWA prohibits the discharge of dredged or fill material into "waters of the United States" (WOTUS) without a permit from the United States Army Corps of Engineers (USACE). The definition of waters of the United States includes rivers, streams, estuaries, territorial seas, ponds, lakes, and wetlands. Wetlands are defined as those areas "that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 Code of Federal Regulations [CFR] 328.3 7b). The U.S. Environmental Protection Agency (EPA) also has authority over wetlands and may override a USACE permit. Substantial impacts to wetlands may require an individual permit. Projects that only minimally affect wetlands may meet the conditions of one of the existing Nationwide Permits. A Water Quality Certification or waiver pursuant to Section 401 of the CWA is required for Section 404 permit actions; in California this certification or waiver is issued by the Regional Water Quality Control Board (RWQCB).

Federal Endangered Species Act (ESA)

The federal Endangered Species Act (ESA) of 1973 protects plants and wildlife that are listed by the United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) as endangered or threatened. Section 9 of the ESA (USA) prohibits the taking of endangered wildlife, where taking is defined as any effort to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct" (50 CFR 17.3). For plants, this statute governs removing, possessing, maliciously damaging, or destroying any endangered plant on federal land and removing, cutting, digging up, damaging, or destroying any endangered plant on non-federal land in knowing violation of state law (16 United States Code [USC] 1538). Under Section 7 of the ESA, federal agencies are required to consult with the USFWS if their actions, including permit approvals or funding, could adversely affect an endangered species (including plants) or its critical habitat. Through consultation and the issuance of a biological opinion, the USFWS may issue an incidental take statement allowing take of the species that is incidental to an otherwise authorized activity, provided the action will not jeopardize the continued existence of the species. The ESA specifies that the USFWS designate habitat for a species at the time of its listing in which are found the physical or biological features "essential to the conservation of the species," or which may require "special Management consideration or protection…" (16 USC § 1533[a][3].2; 16 USC § 1532[a]). This designated Critical Habitat is then afforded the same protection under the ESA as individuals of the species itself, requiring issuance of an Incidental Take Permit prior to any activity that results in "the destruction or adverse modification of habitat determined to be critical" (16 USC § 1536[a][2]).

Interagency Consultation and Biological Assessments

Section 7 of ESA provides a means for authorizing the "take" of threatened or endangered species by federal agencies, and applies to actions that are conducted, permitted, or funded by a federal agency. The statute requires federal agencies to consult with the USFWS or National Marine Fisheries Service (NMFS), as appropriate, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of critical habitat for these species. If a Proposed Project "may affect" a listed species or destroy or modify critical habitat, the lead agency is required to prepare a biological assessment evaluating the nature and severity of the potential effect.

Habitat Conservation Plans

Section 10 of the federal ESA requires the acquisition of an Incidental Take Permit (ITP) from the USFWS by non-federal landowners for activities that might incidentally harm (or "take") endangered or threatened wildlife on their land. To obtain a permit, an applicant must develop a Habitat Conservation Plan that is designed to offset any harmful impacts the proposed activity might have on the species.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 U.S.C. Sections 661 to 667e et seq.) applies to any federal Project where any body of water is impounded, diverted, deepened, or otherwise modified. Project proponents are required to consult with the USFWS and the appropriate state wildlife agency.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (The Eagle Act) (1940), amended in 1962, was originally implemented for the protection of bald eagles (*Haliaeetus leucocephalus*). In 1962, Congress amended the Eagle Act to cover golden eagles (*Aquila chrysaetos*), a move that was partially an attempt to strengthen protection of bald eagles, since the latter were often killed by people mistaking them for golden eagles. This act makes it illegal to import, export, take (molest or disturb), sell, purchase, or barter any bald eagle or golden eagle or part thereof. The golden eagle, however, is accorded somewhat lighter protection under the Eagle Act than that of the bald eagle.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) of 1918 implements international treaties between the United States and other nations created to protect migratory birds, any of their parts, eggs, and nests from activities, such as hunting, pursuing, capturing, killing, selling, and shipping, unless expressly authorized in the regulations or by permit. As authorized by the MBTA, the USFWS issues permits to qualified applicants for the following types of activities: falconry, raptor propagation, scientific collecting, special purposes (rehabilitation, education, migratory game bird propagation, and salvage), take of depredating birds, taxidermy, and waterfowl sale and disposal. The regulations governing migratory bird permits can be found in 50 CFR Part 13 General Permit Procedures and 50 CFR part 21 Migratory Bird Permits. The State of California has incorporated the protection of birds of prey in Sections 3800, 3513, and 3503.5 of the California Fish and Game Code (CFGC).

However, on December 22, 2017 the U.S. Department of the Interior (DOI) issued a memorandum concluding that MBTA's prohibitions on take apply "[…] only to affirmative actions that have as their purpose the taking or killing of migratory birds, their nests, or their eggs" (DOI 2017). Therefore, take of migratory birds or their active nests (i.e., with eggs or young) that is incidental to, and not the purpose of, an otherwise lawful activity does not constitute a violation of the MBTA. Then, on April 11, 2018, the USFWS issued a guidance memorandum that provided further clarification on their interpretation:

> "We interpret the M-Opinion to mean that the MBTA's prohibitions on take apply when the purpose of an action is to take migratory birds, their eggs, or their nests. Conversely, the take of birds, eggs or nests occurring as the result of an activity, the purpose of which is not to take birds, eggs or nests, is not prohibited by the MBTA" (USFWS 2018).

Therefore, the MBTA is currently interpreted to prohibit the take of birds, nests or eggs when the *purpose* or *intent* of the action is to take birds, eggs or nests, not when the take of birds, eggs or nests is incidental to but not the intended purpose of an otherwise lawful action.

Executive Orders (EO)

Invasive Species – EO 13112 (1999): Issued on February 3, 1999, promotes the prevention and introduction of invasive species and provides for their control and minimizes the economic, ecological, and human health impacts that invasive species cause through the creation of the Invasive Species Council and Invasive Species Management Plan.

Migratory Bird – EO 13186 (2001): Issued on January 10, 2001, promotes the conservation of migratory birds and their habitats and directs federal agencies to implement the Migratory Bird Treaty Act. Protection and Enhancement of Environmental Quality—EO 11514 (1970a), issued on March 5, 1970, supports the purpose and policies of the National Environmental Policy Act (NEPA) and directs federal agencies to take measures to meet national environmental goals.

Migratory Bird Treaty Reform Act

The Migratory Bird Treaty Reform Act (Division E, Title I, Section 143 of the Consolidated Appropriations Act, 2005, PL 108–447) amends the Migratory Bird Treaty Act (16 U.S.C. Sections 703 to 712) such that nonnative birds or birds that have been introduced by humans to the United States or its territories are excluded from protection under the Act. It defines a native migratory bird as a species present in the United States and its territories as a result of natural biological or ecological processes. This list excluded two additional species commonly observed in the United States, the rock pigeon (*Columba livia*) and domestic goose (*Anser domesticus*).

Birds of Conservation Concern

Birds of Conservation Concern (BCC) is a USFWS list of bird species identified to have the highest conservation priority, and with the potential for becoming candidates for listing as federally threatened or endangered. The chief legal authority for BCC is the Fish and Wildlife Conservation Act of 1980 (FWCA). Other authorities include the FESA, the Fish and Wildlife Act of 1956, and the Department of the Interior U.S Code (16 U.S.C. § 701). The 1988 amendment to the FWCA (Public Law 100-653, Title VIII) requires the Secretary of the Interior, through the USFWS, to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973" (USFWS, 2008a).

State Regulations

California Fish and Game Code Sections 1600 through 1606 of the CFGC

This section requires that a Streambed Alteration Application be submitted to the CDFW for "any activity that may substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake." The CDFW reviews the proposed actions and, if necessary, submits to the applicant a proposal for measures to protect affected fish and wildlife resources. The final proposal that is mutually agreed upon by the Department and the applicant is the Streambed Alteration Agreement. Often, Projects that require a Streambed Alteration Agreement also require a permit from the USACE under Section 404 of the CWA. In these instances, the conditions of the Section 404 permit and the Streambed Alteration Agreement may overlap.

California Endangered Species Act

The California Endangered Species Act (CESA) (Sections 2050 to 2085) establishes the policy of the state to conserve, protect, restore, and enhance threatened or endangered species and their habitats by protecting "all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants, and their habitats, threatened with extinction and those experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation." Animal species are listed by the CDFW as threatened or endangered, and plants are listed as rare, threatened, or endangered. However, only those plant species listed as threatened or endangered receive protection under the California ESA.

CESA mandates that state agencies do not approve a Project that would jeopardize the continued existence of these species if reasonable and prudent alternatives are available that would avoid a jeopardy finding. There are no state agency consultation procedures under the California ESA. For Projects that would affect a species that is federally and State listed, compliance with ESA satisfies the California ESA if the California Department of Fish and Wildlife (CDFW) determines that the federal incidental take authorization is consistent with the California ESA under Section 2080.1. For Projects that would result in take of a species that is state listed only, the Project sponsor must apply for a take permit, in accordance with Section 2081(b).

Fully Protected Species

Four sections of the California Fish and Game Code (CFGC) list 37 fully protected species (CFGC Sections 3511, 4700, 5050, and 5515). These sections prohibit take or possession "at any time" of the species listed, with few exceptions, and state that "no provision of this code or any other law will be construed to authorize the issuance of permits or licenses to 'take' the species," and that no previously issued permits or licenses for take of the species "shall have any force or effect" for authorizing take or possession.

Bird Nesting Protections

Bird nesting protections (Sections 3503, 3503.5, 3511, 3513 and 3800) in the CFGC include the following:

- Section 3503 prohibits the take, possession, or needless destruction of the nest or eggs of any bird.
- Section 3503.5 prohibits the take, possession, or needless destruction of any nests, eggs, or birds in the orders Falconiformes (new world vultures, hawks, eagles, ospreys, and falcons, among others), and Strigiformes (owls).
- Section 3511 prohibits the take or possession of Fully protected birds.
- Section 3513 prohibits the take or possession of any migratory nongame bird or part thereof, as designated in the MBTA. To avoid violation of the take provisions, it is generally required that Project-related disturbance at active nesting territories be reduced or eliminated during the nesting cycle.

Section 3800 prohibits the take of any non-game bird (i.e., bird that is naturally occurring in California that is not a gamebird, migratory game bird, or fully protected bird).

Native Plant Protection Act

The Native Plant Protect Act (NPPA) (1977) (CFGC Sections 1900-1913) was created with the intent to "preserve, protect, and enhance rare and endangered plants in this State." The NPPA is administered by CDFW. The Fish and Game Commission has the authority to designate native plants as endangered or rare and to protect endangered and rare plants from take. CESA (CFGC 2050-2116) provided further protection for rare and endangered plant species, but the NPPA remains part of the Fish and Game Code.

APPENDIX 3

HISTORICAL/ARCHAEOLOGICAL RESOURCES SURVEY REPORT

CNG FUELING STATION PROJECT

Assessor's Parcel Number 0280-091-27
City of San Bernardino, San Bernardino County, California

For Submittal to:

City of San Bernardino
Community Development Department, Planning Division
201 North E Street, Third Floor
San Bernardino, CA 92401

Prepared for:

Tom Dodson & Associates
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San Bernardino, CA 92405

Prepared by:

CRM TECH
1016 East Cooley Drive, Suite A/B
Colton, CA 92324

Bai "Tom" Tang, Principal Investigator
Michael Hogan, Principal Investigator

December 20, 2021
CRM TECH Contract No. 3777

Title: Historical/Archaeological Resources Survey Report: CNG Fueling Station Project, Assessor's Parcel Number 0280-091-27, City of San Bernardino, San Bernardino County, California

Author(s): Bai "Tom" Tang, Principal Investigator/Historian
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Date: December 20, 2021

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Prepared for: Tom Dodson, President
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USGS Quadrangle: San Bernardino South, Calif., 7.5' quadrangle (Rancho San Bernardino land grant; T1S R4W, San Bernardino Baseline and Meridian)

Project Size: Approximately 6.35 acres

Keywords: San Bernardino Valley; Phase I cultural resources survey; Site 36-013546 (CA-SBR-12596): olive grove and concrete slab foundations (no longer extant); no "historical resources" under CEQA

EXECUTIVE SUMMARY

Between September and December 2021, at the request of Tom Dodson and Associates, Inc., CRM TECH performed a cultural resources study on approximately 6.35 acres of former agricultural land in the southern portion of the City of San Bernardino, San Bernardino County, California. The subject property of the study, Assessor's Parcel Number 0280-091-27, is located on the north side of Central Avenue and the west side of Tippecanoe Avenue, in a portion of the Rancho San Bernardino land grant lying within Township 1 South Range 4 West, San Bernardino Baseline and Meridian.

The study is part of the environmental review process for the proposed construction of a compressed natural gas (CNG) vehicle fueling station on the property, which entails primarily the installation of a total of four fast-fill CNG dispensers and the construction of associated facilities, such as control equipment pads, a canopy, bioretention basins, and paved parking spaces, along with landscaping and utility work, to be completed in two phases. The City of San Bernardino, as the lead agency for the project, required the study in compliance with the California Environmental Quality Act (CEQA).

The purpose of the study is to provide the City with the necessary information and analysis to determine the project would cause a substantial adverse change in the significance of a "historical resource," as defined by CEQA. In order to identify such resources, CRM TECH reviewed the results of a historical/archaeological resources records search and a Native American Sacred Lands File search conducted on an adjacent parcel in 2019, contacted the nearby San Manuel Band of Mission Indians, pursued historical background research, and carried out an intensive-level field survey of the project area.

The results of these research procedures indicate that an archaeological site from the late historic period, 36-013546 (CA-SBR-12596H), was previously recorded as lying partially within in the project area. When first recorded in 2007, the site consisted of an olive grove with more than 300 trees, most of them located within the current project area, along with the remains of a circa 1940 residence and other associated features on adjacent land to the southeast, all of which have been removed at this time. Site 36-013546, therefore, no longer exists and requires no further consideration in relation to the proposed project.

The Sacred Lands File search results from 2019 indicate the presence of unspecified Native American cultural resource(s) in the general vicinity, and the State of California Native American Heritage Commission referred further inquiry to the San Manuel Band of Mission Indians. At the time, the San Manuel Band clarified that this area lies between two Native American cultural resources some distance away and not within either of them. When contacted by CRM TECH during this study, the tribe reiterated that they have minimal cultural resources concerns over the project location and Site 36-013546 but would seek further, government-to-government consultation with the City of San Bernardino.

Based on these findings, CRM TECH recommends to the City of San Bernardino a conclusion of *No Impact* on "historical resources." No further cultural resources investigation is recommended for the project unless construction plans undergo such changes as to include areas not covered by this study. However, if buried cultural materials are discovered during earth-moving operations associated with the project, all work in the immediate area should be halted or diverted until a qualified archaeologist can evaluate the nature and significance of the finds.

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INTRODUCTION

Between September and December 2021, at the request of Tom Dodson and Associates, Inc., CRM TECH performed a cultural resources study on approximately 6.35 acres of former agricultural land in the southern portion of the City of San Bernardino, San Bernardino County, California (Fig. 1). The subject property of the study, Assessor's Parcel Number 0280-091-27, is located on the north side of Central Avenue and the west side of Tippecanoe Avenue, in a portion of the Rancho San Bernardino land grant lying within Township 1 South Range 4 West, San Bernardino Baseline and Meridian (Figs. 2, 3).

The study is part of the environmental review process for the proposed construction of a compressed natural gas (CNG) vehicle fueling station on the property, which entails primarily the installation of a total of four fast-fill CNG dispensers and the construction of associated facilities, such as control equipment pads, a canopy, bioretention basins, and paved parking spaces, along with landscaping and utility work, to be completed in two phases. The City of San Bernardino, as the lead agency for the project, required the study in compliance with the California Environmental Quality Act (CEQA; PRC §21000, et seq.).

The purpose of the study is to provide the City with the necessary information and analysis to determine the project would cause a substantial adverse change in the significance of a "historical resource," as defined by CEQA. In order to identify such resources, CRM TECH reviewed the results of a historical/archaeological resources records search and a Native American Sacred Lands File search conducted on an adjacent parcel in 2019, contacted the nearby San Manuel Band of

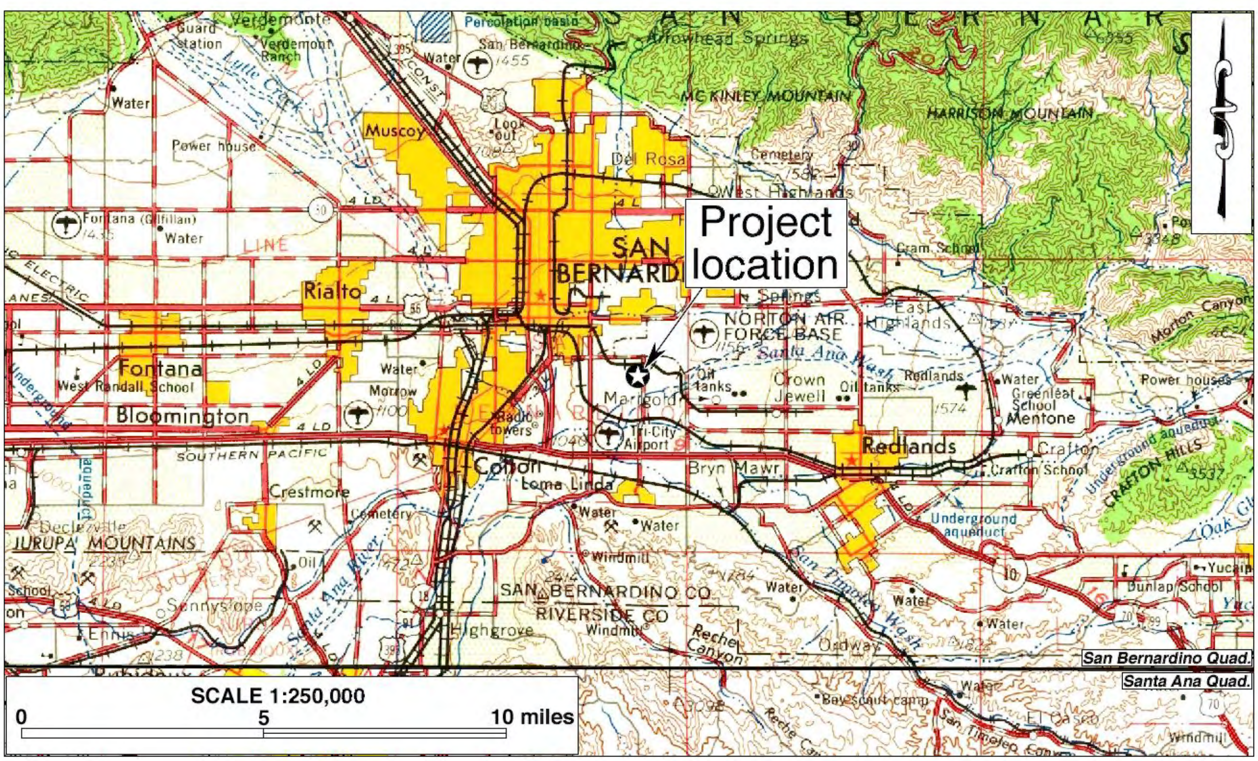

Figure 1. Project vicinity. (Based on USGS San Bernardino and Santa Ana, Calif., 120'x60' quadrangles [USGS 1969, 1979])

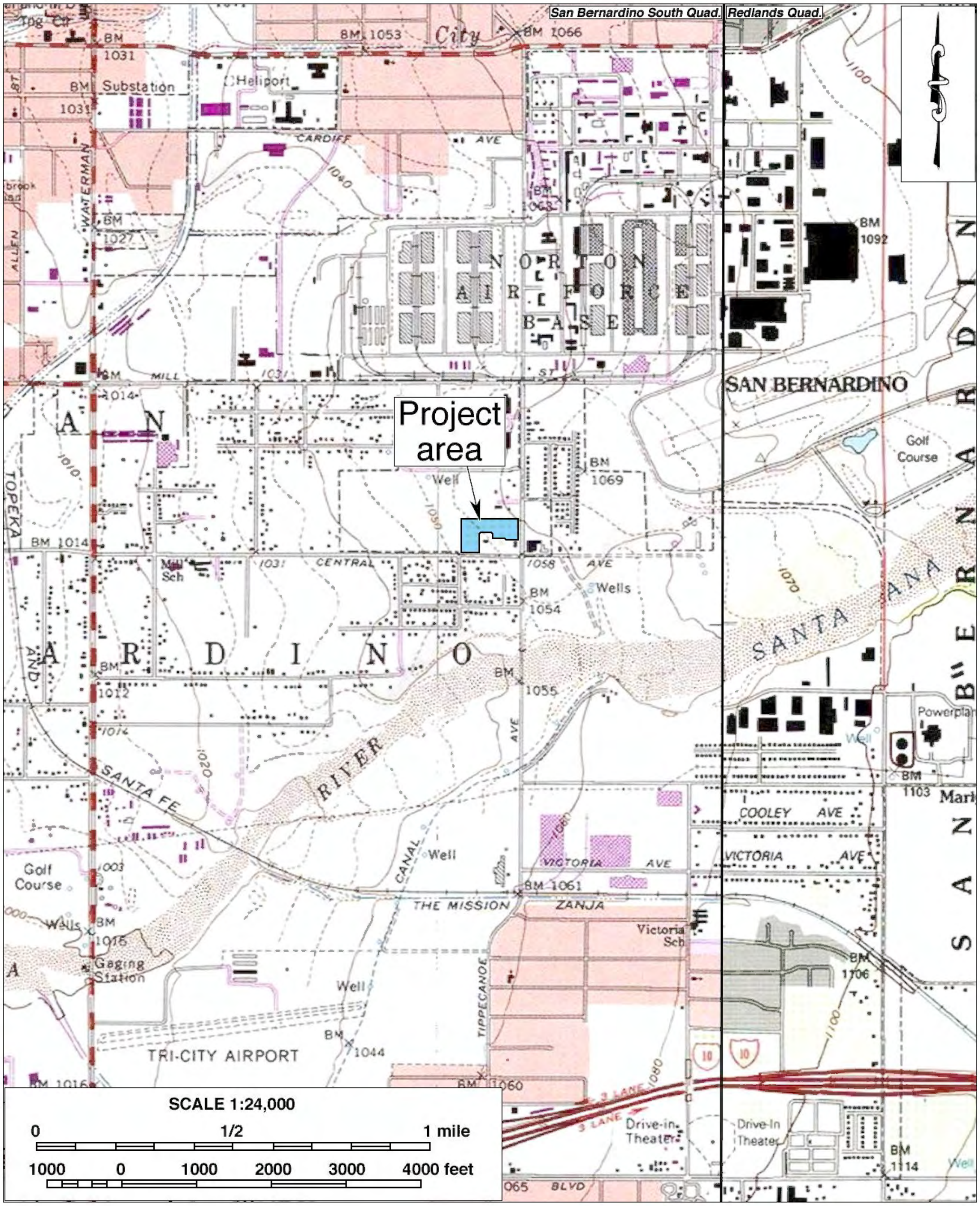

Figure 2. Project area. (Based on USGS San Bernardino South and Redlands, Calif., 7.5' quadrangle [USGS 1980; 1996])

Figure 3. Aerial view of the project area.

Mission Indians, pursued historical background research, and carried out an intensive-level field survey of the project area. This report presents a full account of the methods, results, and final conclusion of the study. Qualifications of the participating research personnel are provided in Appendix 1.

SETTING

CURRENT NATURAL SETTING

The City of San Bernardino is situated in the eastern portion of the San Bernardino Valley, a broad inland valley defined by the San Gabriel and San Bernardino mountain ranges on the north to the Santa Ana Mountains and the Jurupa Hills on the south. The Mediterranean climate of the San Bernardino Valley is typical of inland southern California, or the Inland Empire, with the average maximum temperature in July reaching 96º Fahrenheit and the average minimum temperature in December dropping to 41º. Rainfall is typically less than 17 inches annually, most of which occurs between November and March.

Situated on the edge of an industrial district developed immediately to the west of the San Bernardino International Airport (formerly Norton Air Force Base) over the last three decades, the irregularly shaped project area is bounded by Central Avenue on the south, Tippecanoe Avenue on the east, a trucking business on the north, and a manufacturing plant on the west. An approximately 2.63-acre tract of vacant land lies to the southeast of the project area, occupying the northwestern corner of Central Avenue and Tippecanoe Avenue (Fig. 3). The project area itself is also vacant at this time. It served as an olive grove until recently (NETR Online 1938-2018; Google Earth 1994-2021; Shaver 2007), but almost all of the trees have been removed (Fig. 4).

Virtually the entire project area has been greatly disturbed by the past agricultural activities. More recently, the property has been affected by illicit dumping of building debris, discarded furniture, and domestic refuse. Heavy equipment usage for the removal of the trees and other vegetation is also evident. The terrain in this area is relatively level, with elevations ranging around 1,055 to 1,060 feet above mean sea level. Soils are alluvial in nature, consisting of light grayish-brown sandy loam. Vegetation is sparse and limited to a few remaining olive trees and scattered weeds (Fig. 4).

CULTURAL SETTING

Archaeological Context

The earliest evidence of human occupation in inland southern California was discovered below the surface of an alluvial fan in the northern portion of the Lakeview Mountains, overlooking the San Jacinto Valley, with radiocarbon dates clustering around 9,500 B.P. (Horne and McDougall 2008). Another site found near the shoreline of Lake Elsinore, close to the confluence of Temescal Wash and the San Jacinto River, yielded radiocarbon dates between 8,000 and 9,000 B.P. (Grenda 1997). Additional sites with isolated Archaic dart points, bifaces, and other associated lithic artifacts from

Figure 4. Current condition of the project area, view to the northwest. (Photograph taken on September 24, 2021)

the same age range have been found in the Cajon Pass area of the San Bernardino Mountains, typically atop knolls with good viewsheds (Basgall and True 1985; Goodman and McDonald 2001; Goodman 2002; Milburn et al. 2008).

The cultural history of southern California has been summarized into numerous chronologies, including those developed by Chartkoff and Chartkoff (1984), Warren (1984), and others. Specifically, the prehistory of the inland region has been addressed by O'Connell et al. (1974), McDonald et al. (1987), Keller and McCarthy (1989), Grenda (1993), Goldberg (2001), and Horne and McDougall (2008). Although the beginning and ending dates of the recognized cultural horizons vary among different parts of the region, the general framework of the prehistory of the Inland Empire can be broken into three primary periods:

- Paleoindian Period (ca. 18,000-9,000 B.P.): Native peoples of this period created fluted spearhead bases designed to be hafted to wooden shafts. The distinctive method of thinning bifaces and spearhead preforms by removing long, linear flakes leaves diagnostic Paleoindian markers at tool-making sites. Other artifacts associated with the Paleoindian toolkit include choppers, cutting tools, retouched flakes, and perforators. Sites from this period are very sparse across the landscape and most are deeply buried.
- Archaic Period (ca. 9,000-1,500 B.P.): Archaic sites are characterized by abundant lithic scatters of considerable size with many biface thinning flakes, bifacial preforms broken during manufacture, and well-made groundstone bowls and basin metates. As a consequence of making dart points, many biface thinning waste flakes were generated at individual production stations, which is a diagnostic feature of Archaic sites.

- Late Prehistoric Period (ca. 1,500 B.P.-contact): Sites from this period typically contain small lithic scatters from the manufacture of small arrow points, expedient groundstone tools such as tabular metates and unshaped manos, wooden mortars with stone pestles, acorn or mesquite bean granaries, ceramic vessels, shell beads suggestive of extensive trading networks, and steatite implements such as pipes and arrow shaft straighteners.

Ethnohistoric Context

The present-day San Bernardino area is generally recognized as a part of the homeland of the Serrano people, although other Native groups, such as the Gabrielino of the Los Angeles Basin, also claim the area as a part of their cultural influence. Together with that of the Vanyume people, linguistically a subgroup, the traditional territory of the Serrano also includes part of the San Gabriel Mountains, much of the San Bernardino Valley, and the Mojave River valley in the southern portion of the Mojave Desert, reaching as far east as the Cady, Bullion, Sheep Hole, and Coxcomb Mountains. The name of the group, Serrano, was derived from a Spanish term meaning "mountaineer" or "highlander." The basic written sources on Serrano culture are Kroeber (1925), Strong (1929), and Bean and Smith (1978), and the following ethnographic discussion of the Serrano people is based primarily on these sources.

Prior to European contact, native subsistence practices were defined by the surrounding landscape and were based primarily on the cultivating and gathering of wild foods and hunting, exploiting nearly all of the resources available. The Serrano settled mostly on elevated terraces, hills, and finger ridges near where flowing water emerged from the mountains. They were loosely organized into exogamous clans, which were led by hereditary heads, and the clans in turn were affiliated with one of two exogamous moieties, the Wildcat (*Tukutam*) or the Coyote (*Wahiiam*). The exact nature of the clans, their structure, function, and number are not known, except that each clan was the largest autonomous political and landholding unit, the core of which was the patrilineage.

The Serrano had a variety of technological skills that they used to acquire subsistence, shelter, and medicine or to create ornaments and decorations. Common tools included manos and metates, mortars and pestles, hammerstones, fire drills, awls, arrow straighteners, and stone knives and scrapers. These lithic tools were made from locally sourced material as well as those procured through trade or travel. The Serrano also used wood, horn, and bone spoons and stirrers; baskets for winnowing, leaching, grinding, transporting, parching, storing, and cooking; and pottery vessels for carrying water, storage, cooking, and serving food and drink. Much of this material cultural, elaborately decorated, does not survive in the archaeological record. As usual, the main items found archaeologically relate to subsistence activities.

Although contact with Europeans may have occurred as early as 1771 or 1772, direct European influence on Serrano lifeways began in the 1810s, when the mission system expanded to the edge of their territory. Between then and the end of the mission era in 1834, most of the Serrano in the western portion of their traditional territory were removed to the nearby missions. In the eastern portion, a series of punitive expeditions in 1866-1870 resulted in the death or displacement of almost all remaining Serrano population in the San Bernardino Mountains. Today, most Serrano descendants are affiliated with the San Manuel Band of Mission Indians, the Morongo Band of Mission Indians, or the Serrano Nation of Indians.

Historic Context

The San Bernardino Valley, along with the rest of Alta California, was claimed by Spain in the late 18th century, and the first European explorers traveled through the area as early as 1772, three years after the beginning of Spanish colonization (Beck and Haase 1974:15). For nearly four decades afterwards, however, the arid inland valley received little attention from the European colonizers, who concentrated their efforts along the Pacific coast. Following the establishment of Mission San Gabriel in 1771, the San Bernardino Valley became a part of the vast landholdings of that mission. The name "San Bernardino" was bestowed on the region in the 1810s, when the *asistencia* and an associated mission rancho, both bearing that name, were established in present-day Loma Linda (Lerch and Haenszel 1981).

After gaining independence from Spain in 1821, the Mexican authorities in Alta California began secularization of the mission system in 1834. During the next 12 years, mission lands throughout Alta California were surrendered to the Mexican government and subsequently granted to various prominent citizens of the province. In 1842, the former mission rancho of San Bernardino was granted to the Lugos, a prominent Los Angeles family, who were engaged in cattle-raising on the more than 35,000-acre domain (Schuiling 1984:34). After the American annexation of Alta California in 1848, the Lugos sold their land in 1851 to a group of Mormon settlers sent by church leaders in Utah, who promptly established a fortified settlement and named it Fort San Bernardino (*ibid.*:45).

The early growth of the Mormon colony was promising. It became county seat of the newly created San Bernardino County in 1853 and incorporated as a city the next year (Schuiling 1984:48-49). In 1857, however, half of the population was recalled to Utah by Mormon leaders, and the budding town was disincorporated (*ibid.*:50). In the 1880s, spurred by the selection of San Bernardino as the regional headquarters of the newly completed Atchison, Topeka and Santa Fe Railway, the rise of the profitable citrus industry, and a general land boom that swept through much of southern California, San Bernardino gradually recovered, reincorporated in 1886, and embarked on a period of steady growth.

During World War II, the growth of San Bernardino was further boosted when the U.S. Army Air Corps established a pilot training base in the southeastern portion of the city in 1941 (Richards 1966). Renamed Norton Air Force Base in 1950, this military installation proved to be an important driving force in the local economy for the next 45 years. In 1994, the base was officially closed, and its 2,400-acre site was transferred to local civilian authorities for redevelopment in 1999, ultimately becoming today's San Bernardino International Airport.

The original townsite of San Bernardino, as recorded in 1854, was bounded by present-day Tenth Street, Sierra Way, Rialto Avenue, and I Street (Donaldson 1991). By 1907, the urbanized area of the city had expanded to 16th Street on the north, Waterman Avenue on the east, Mill Street on the south, and beyond Mount Vernon Avenue on the west (*ibid.*). The project area lies well outside the original townsite, and was a much later addition to the city's urban core. Largely undeveloped prior to WWII, the area began to take on its present-day industrial/commercial character during the mid-20th century, as discussed further below.

RESEARCH METHODS

RECORDS SEARCH

Due to extended delays caused by facility closure during the COVID-19 pandemic, a historical/archaeological resources records search on the project area was not obtained for this study from the South Central Coastal Information Center (SCCIC), the State of California's official cultural resource records repository for the County of San Bernardino. Instead, project archaeologist Deirdre Encarnación reviewed the results of a previous records search that CRM TECH conducted at the SCCIC in August 2019, during a similar study on the adjacent property to the southeast. From these data and other recent studies in the vicinity, Encarnación was able to construct a coverage of existing records pertaining to an approximately one-mile radius of the current project location as of 2019. Since the SCCIC has not updated its collection since the beginning of the pandemic in March 2020, the coverage was considered adequate for this study.

NATIVE AMERICAN INPUT

Also as a part the 2019 study on the adjacent property, CRM TECH requested a Sacred Lands File search on the project vicinity from the State of California Native American Heritage Commission (NAHC), and the results of the search were used for reference during this study. As the NAHC referred further inquiries to the San Manuel Band of Mission Indians at that time, CRM TECH contacted the tribe's Cultural Resources Management Department again during this study to confirm and update their input during the 2019 study. The NAHC's Sacred Lands File search results and the response from the San Manuel Band are attached to this report in Appendix 2 and summarized in the sections below.

HISTORICAL RESEARCH

Historical background research for this study was conducted by CRM TECH principal investigator/historian Bai "Tom" Tang. Sources consulted during the research included published literature in local and regional history, various online genealogical databases, U.S. Geological Survey (USGS) topographic maps dated 1901-1996, and aerial photographs taken in 1938-2021. The historic maps are accessible at the USGS website, and the aerial photographs are available at the Nationwide Environmental Title Research (NETR) Online website and through the Google Earth software.

FIELD SURVEY

On September 24, 2021, CRM TECH archaeologist Salvadore Z. Boites carried out the intensive-level field survey of the project area. The survey was completed by walking a series of parallel transects oriented north-south and spaced 15 meters (approximately 50 feet) apart. In this way, the ground surface of the entire project area was systematically and carefully examined for any evidence of human activities dating to the prehistoric or historic period (i.e., 50 years or older). Ground visibility was generally good (80%) due to the light vegetative cover.

RESULTS AND FINDINGS

RECORDS SEARCH

According to the 2019 records search results, the project area had not been surveyed systematically for cultural resources prior to that study (Tang et al. 2019:8). However, during a 2006-2007 survey for a street improvements project on Central Avenue, a historic-period archaeological site was recorded as lying partially within the current project area (Shaver 2007). Designated 36-013546 (CA-SBR-12596H) in the California Historical Resources Inventory, the site consisted of an olive grove with more than 300 trees, most of them within the project area, as well as features found on the adjacent property to the southeast, including two concrete slab foundations, a concrete-lined pond, other ornamental trees, and "four large debris piles containing construction materials from recently demolished buildings" (Shaver and Shaver 2007). The site covered a total area of approximately 7.7 acres (*ibid*.; see App. 3).

Within the one-mile scope of the records search, SCCIC records show at least 31 other studies, as of 2019, on various tracts of land and linear features (Fig. 5), resulting in the identification of 45 additional historical/archaeological sites in the one-mile radius. All of these known sites dated to the historic period, and no prehistoric—i.e., Native American—archaeological remains were previously recorded within the scope of the records search. Among the 45 sites were 36 buildings, several more structural foundations, bridges, a refuse scatter, an irrigation system, the 750-acre Marigold Farm, and the former Atchison, Topeka and Santa Fe Railway. Other than 36-013546, none of the sites was found within or immediate adjacent to the project area. Therefore, none of them requires further consideration during this study.

NATIVE AMERICAN INPUT

In response to CRM TECH's request during the study on the adjacent property, the NCHC stated in a letter dated September 19, 2019, that the Sacred Lands File identified unspecified Native American cultural resource(s) in the general vicinity and referred further inquiry to the San Manuel Band of Mission Indians, as mentioned above (see App. 2). When contacted by CRM TECH at the time, the tribe's Cultural Resources Management Department replied that this area was located between two known Native American cultural resources but not within either of them. Therefore, the tribe did not consider this location to be an area of heightened concern (Tang et al. 2019:10).

Upon commencement of the present study, CRM TECH contacted the San Manuel Band again on November 18, 2021, for confirmation and update of their input in 2019. In reply, Ryan Nordness, Cultural Resource Analyst with San Manuel Cultural Resources Management Department, stated by e-mail on the same day that the tribe was aware of the presence of Site 36-013546 in the project area but had minimal concerns about this site. Nevertheless, Mr. Nordness indicated that the tribe would like to seek further, government-to-government consultation with the City of San Bernardino regarding this project. Mr. Nordness did not provide any additional information on the Native American cultural resource(s) identified by the NAHC's e Sacred Lands File.

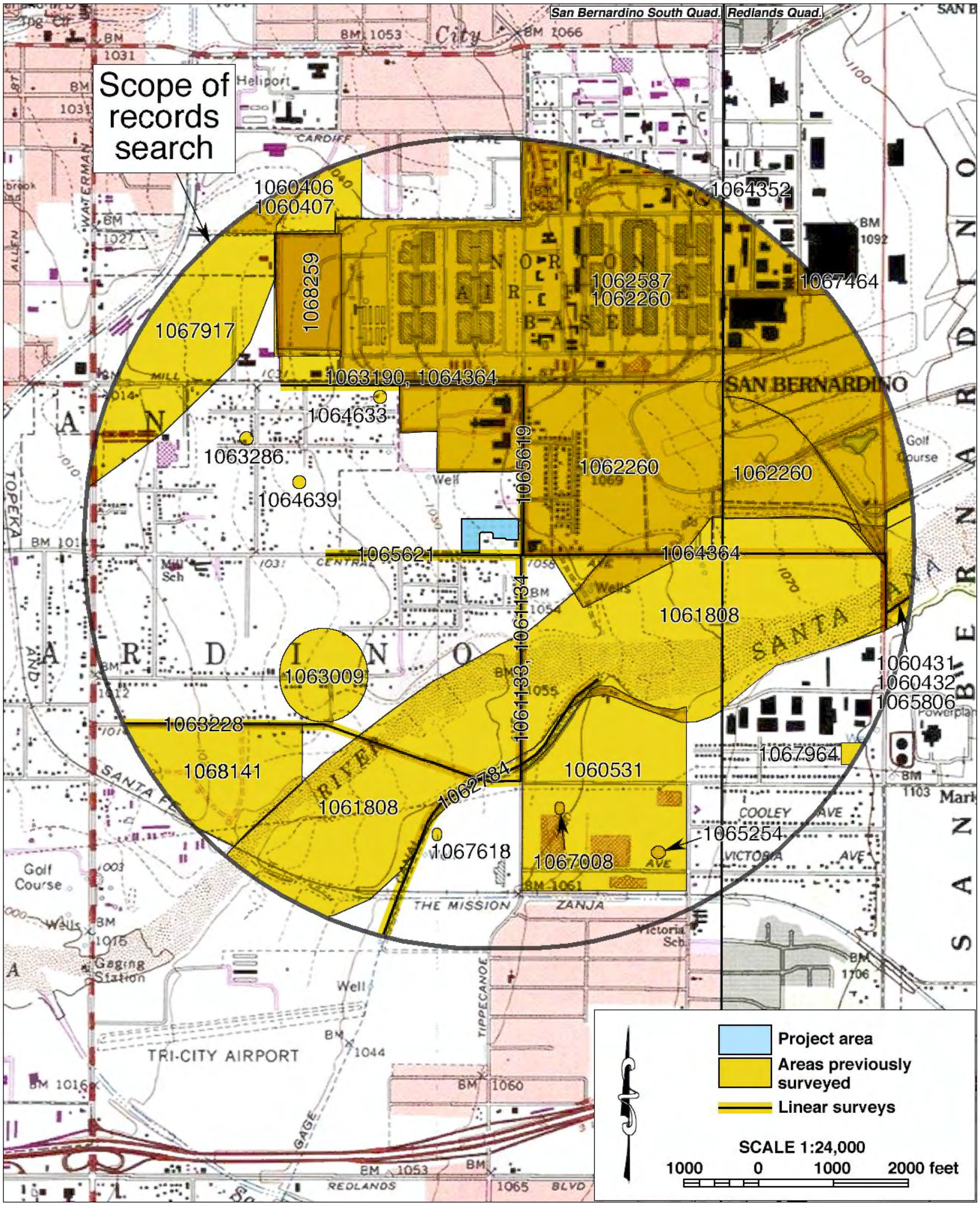

Figure 5. Previous cultural resources studies in the vicinity of the project area, listed by SCCIC file number. Locations of historical/archaeological resources are not shown as a protective measure.

HISTORICAL RESEARCH

Historical maps indicate that, although situated on the less developed southern outskirts of San Bernardino, the project area had seen the beginning of settlement and development activities at least by the 1890s, when a building was noted in the northeastern corner of the property (Fig. 6). Other human-made features known to be present in the immediate vicinity at that time included the forerunners of present-day Central Avenue and Tippecanoe Avenue and a railroad known as the Redlands Motor Line (Fig. 6).

The Redlands Motor Line traversed east-west across the southern edge of the project area along Central Avenue before turning south along Tippecanoe Avenue (Fig. 6). Called the Dinky line locally, the 10-mile-long narrow-gauge railroad was originally built in 1887-1888 by the San Bernardino and Redlands Railroad Company to provide regular passenger service between downtown San Bernardino and downtown Redlands (Landis n.d.; CA Genealogy n.d.). The service continued as a subsidiary of the Southern Pacific Railroad until 1915, often at a loss, but the rail line was subsequently abandoned (*Redlands Daily Facts* 2015).

By the 1930s, the building in the project area and the Redlands Motor Line had been removed, and the entire project area was occupied by the olive grove recorded as a part of Site 36-013546 (Fig. 7; NETR Online 1938). The grove evidently began sometime between 1918 and 1922, when the project area was part of a 10-acre parcel owned by G.A. Atwood (Shaver and Shaver 2007:3). Around 1939, the Atwood family sold most of the property to H.J. and Lillian E. Esselman, who subsequently built the residence on the adjacent land to the southeast (*ibid.*:6). Hubert James Esselman (1884-1954), an accountant, and Lillian Emeline Esselman (1883-1963), a housewife, had previously lived in Long Beach, Fawnskin, Crestline, and elsewhere in San Bernardino, but were listed as residents of the parcel at least by 1942 (Ancestry.com n.d.).

Figure 6. The project area and vicinity in 1893-1899.
(Source: USGS 1901a; 1901b)

In the post-WWII era, at least one more building was added on the Esselman property, also to the southeast of the project area, while the land within the project boundary continued to be occupied by the olive grove (NETR Online 1959; Fig. 8). The buildings on the adjacent land were eventually demolished in 2006-2009, while the olive grove remained until sometime between April 2020 and April 2021, when most of the trees were removed (NETR Online 1959-2018; Google Earth 1994-2021; Shaver and Shaver 2007). The entire project area has evidently been left unused since then (Google Earth 2021).

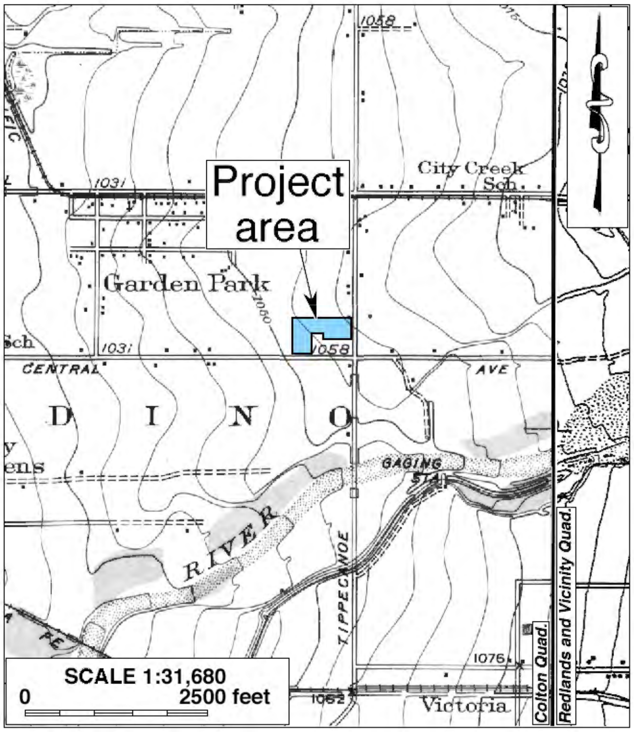

Figure 7. The project area and vicinity in 1936-1939.
(Source: USGS 1943a; 1943b)

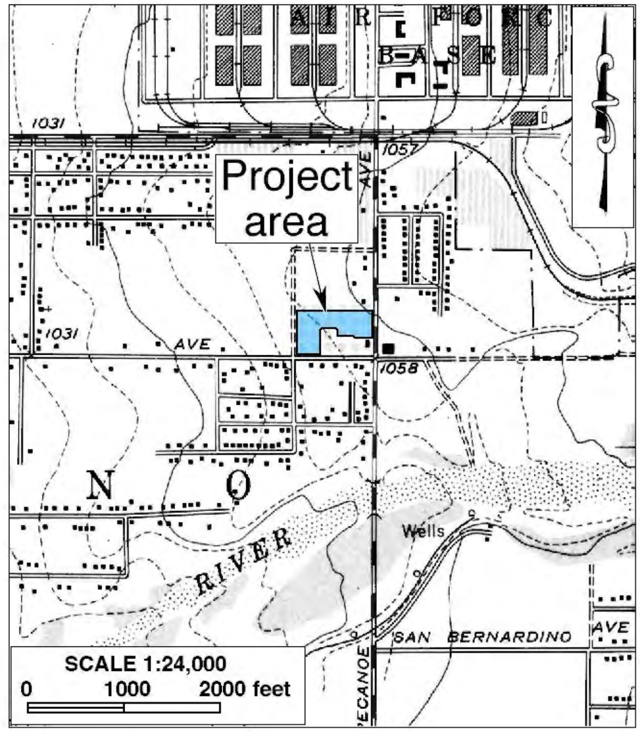

Figure 8. The project area and vicinity in 1952-1954.
(Source: USGS 1954)

FIELD SURVEY

The results of the field survey confirm that the olive grove previously recorded in the project area as a part of Site 36-013546 has been removed, with only a few scattered trees remaining (Fig. 4). On the adjacent property, the structural foundations and other features recorded in 2007 and observed during the 2019 survey have also been removed. For all practical purposes, therefore, Site 36-013546 no longer exists. No other features or artifacts of prehistoric or historical origin were encountered in the project area throughout the course of the survey.

MANAGEMENT CONDITIONS

APPLICABLE STATUTORY/REGULATORY FRAMEWORK

CEQA establishes that "a project that may cause a substantial adverse change in the significance of a historical resource is a project that may have a significant effect on the environment" (PRC §21084.1). "Substantial adverse change," as defined by PRC §5020.1(q), "means demolition, destruction, relocation, or alteration such that the significance of a historical resource would be impaired." According to PRC §5020.1(j), "'historical resource' includes, but is not limited to, any object, building, site, area, place, record, or manuscript which is historically or archaeologically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California."

More specifically, CEQA guidelines state that the term “historical resources” applies to any such resources listed in or determined to be eligible for listing in the California Register of Historical Resources, included in a local register of historical resources, or determined to be historically significant by the lead agency (Title 14 CCR §15064.5(a)(1)-(3)). Regarding the proper criteria for the evaluation of historical significance, CEQA guidelines mandate that “generally a resource shall be considered by the lead agency to be ‘historically significant’ if the resource meets the criteria for listing on the California Register of Historical Resources” (Title 14 CCR §15064.5(a)(3)). A resource may be listed in the California Register if it meets any of the following criteria:

(1) Is associated with events that have made a significant contribution to the broad patterns of California’s history and cultural heritage.
(2) Is associated with the lives of persons important in our past.
(3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.
(4) Has yielded, or may be likely to yield, information important in prehistory or history. (PRC §5024.1(c))

CONCLUSION AND RECOMMENDATIONS

In summary of the research results presented above, an archaeological site from the late historic period, 36-013546 (CA-SBR-12596H), was previously recorded as lying partially within in the project area. When first recorded in 2007, the site consisted of an olive grove with more than 300 trees, most of them located within the current project area, along with the remains of a circa 1940 residence and other associated features on adjacent land to the southeast, all of which have been removed at this time. Site 36-013546, therefore, no longer exists and requires no further consideration in relation to the proposed project.

The Sacred Lands File search results from 2019 indicate the presence of unspecified Native American cultural resource(s) in the general vicinity, and the State of California Native American Heritage Commission referred further inquiry to the San Manuel Band of Mission Indians. At the time, the San Manuel Band clarified that this area lies between two Native American cultural resources some distance away and not within either of them. When contacted by CRM TECH during this study, the tribe reiterated that they have minimal cultural resources concerns over the project location and Site 36-013546 but would seek further, government-to-government consultation with the City of San Bernardino.

Based on these findings, CRM TECH presents the following recommendations to the City of San Bernardino:

- No “historical resources” exist within or adjacent to the project area, and thus the project as currently proposed will not cause a substantial adverse change to any known “historical resources.”
- No further cultural resources investigation will be necessary for the project unless construction plans undergo such changes as to include areas not covered by this study.
- If buried cultural materials are discovered during future earth-moving operations associated with the project, all work in the immediate area should be halted or diverted until a qualified archaeologist can evaluate the nature and significance of the finds.

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1980 Map: San Bernardino South, Calif. (7.5', 1:24,000); 1967 edition photorevised in 1979.
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APPENDIX 1
PERSONNEL QUALIFICATIONS

PRINCIPAL INVESTIGATOR, HISTORY
Bai "Tom" Tang, M.A.

Education

1988-1993	Graduate Program in Public History/Historic Preservation, University of California, Riverside.
1987	M.A., American History, Yale University, New Haven, Connecticut.
1982	B.A., History, Northwestern University, Xi'an, China.

2000	"Introduction to Section 106 Review," presented by the Advisory Council on Historic Preservation and the University of Nevada, Reno.
1994	"Assessing the Significance of Historic Archaeological Sites," presented by the Historic Preservation Program, University of Nevada, Reno.

Professional Experience

2002-	Principal Investigator, CRM TECH, Riverside/Colton, California.
1993-2002	Project Historian/Architectural Historian, CRM TECH, Riverside, California.
1993-1997	Project Historian, Greenwood and Associates, Pacific Palisades, California.
1991-1993	Project Historian, Archaeological Research Unit, University of California, Riverside.
1990	Intern Researcher, California State Office of Historic Preservation, Sacramento.
1990-1992	Teaching Assistant, History of Modern World, University of California, Riverside.
1988-1993	Research Assistant, American Social History, University of California, Riverside.
1985-1988	Research Assistant, Modern Chinese History, Yale University.
1985-1986	Teaching Assistant, Modern Chinese History, Yale University.
1982-1985	Lecturer, History, Xi'an Foreign Languages Institute, Xi'an, China.

Cultural Resources Management Reports

Preliminary Analyses and Recommendations Regarding California's Cultural Resources Inventory System (with Special Reference to Condition 14 of NPS 1990 Program Review Report). California State Office of Historic Preservation working paper, Sacramento, September 1990.

Numerous cultural resources management reports with the Archaeological Research Unit, Greenwood and Associates, and CRM TECH, since October 1991.

PRINCIPAL INVESTIGATOR, ARCHAEOLOGY
Michael Hogan, Ph.D., RPA (Registered Professional Archaeologist)

Education

1991	Ph.D., Anthropology, University of California, Riverside.
1981	B.S., Anthropology, University of California, Riverside; with honors.
1980-1981	Education Abroad Program, Lima, Peru.

2002	"Section 106—National Historic Preservation Act: Federal Law at the Local Level," UCLA Extension Course #888.
2002	"Recognizing Historic Artifacts," workshop presented by Richard Norwood, Historical Archaeologist.
2002	"Wending Your Way through the Regulatory Maze," symposium presented by the Association of Environmental Professionals.
1992	"Southern California Ceramics Workshop," presented by Jerry Schaefer.
1992	"Historic Artifact Workshop," presented by Anne Duffield-Stoll.

Professional Experience

2002-	Principal Investigator, CRM TECH, Riverside/Colton, California.
1999-2002	Project Archaeologist/Field Director, CRM TECH, Riverside, California.
1996-1998	Project Director and Ethnographer, Statistical Research, Inc., Redlands, California.
1992-1998	Assistant Research Anthropologist, University of California, Riverside.
1992-1995	Project Director, Archaeological Research Unit, U.C. Riverside.
1993-1994	Adjunct Professor, Riverside Community College, Mt. San Jacinto College, U.C. Riverside, Chapman University, and San Bernardino Valley College.
1991-1992	Crew Chief, Archaeological Research Unit, U.C. Riverside.
1984-1998	Project Director, Field Director, Crew Chief, and Archaeological Technician for various southern California cultural resources management firms.

Research Interests

Cultural Resource Management, Southern Californian Archaeology, Settlement and Exchange Patterns, Specialization and Stratification, Culture Change, Native American Culture, Cultural Diversity.

Cultural Resources Management Reports

Principal investigator for, author or co-author of, and contributor to numerous cultural resources management study reports since 1986.

Memberships

Society for American Archaeology; Society for California Archaeology; Pacific Coast Archaeological Society; Coachella Valley Archaeological Society.

PROJECT ARCHAEOLOGIST/REPORT WRITER
Deirdre Encarnación, M.A.

Education

2003	M.A., Anthropology, San Diego State University, California.
2000	B.A., Anthropology, minor in Biology, with honors; San Diego State University, California.
2021	Certificate of Specialization, Kumeyaay Studies, Cuyamaca College, California.
2001	Archaeological Field School, San Diego State University.
2000	Archaeological Field School, San Diego State University.

Professional Experience

2004-	Project Archaeologist/Report Writer, CRM TECH, Riverside/Colton, California.
2001-2003	Part-time Lecturer, San Diego State University, California.
2001	Research Assistant for Dr. Lynn Gamble, San Diego State University.
2001	Archaeological Collection Catalog, SDSU Foundation.

Memberships

Society for California Archaeology; Society for Hawaiian Archaeology; California Native Plant Society.

PROJECT ARCHAEOLOGIST
Salvadore Z. Boites, M.A.

Education

2013	M.A., Applied Anthropology, California State University, Long Beach.
2003	B.A., Anthropology/Sociology, University of California, Riverside.
1996-1998	Archaeological Field School, Fullerton Community College, Fullerton, California.

Professional Experience

2014-	Project Archaeologist, CRM TECH, Colton, California.
2010-2011	Adjunct Instructor, Anthropology, Everest College, Anaheim, California.
2003-2008	Project Archaeologist, CRM TECH, Riverside/Colton, California.
2001-2002	Teaching Assistant, Moreno Elementary School, Moreno Valley, California.
1999-2003	Research Assistant, Anthropology Department, University of California, Riverside.

APPENDIX 2

NATIVE AMERICAN RESPONSES*

* The Sacred Lands File search was conducted in 2019 on an adjacent parcel to the southeast of the current project area.

NATIVE AMERICAN HERITAGE COMMISSION
Cultural and Environmental Department
1550 Harbor Blvd., Suite 100
West Sacramento, CA 95691
Phone: (916) 373-3710
Email: nahc@nahc.ca.gov
Website: http://www.nahc.ca.gov
Twitter: @CA_NAHC

September 19, 2019

Nina Gallardo
CRM Tech

VIA Email to: ngallardo@crmtech.us

RE: Fuel Center & Convenience Store Project, San Bernardino County

Dear Ms. Gallardo:

A record search of the Native American Heritage Commission (NAHC) Sacred Lands File (SLF) was completed for the information you have submitted for the above referenced project. The results were positive. Please contact the San Manuel Band of Mission Indians on the attached list for more information. Other sources of cultural resources should also be contacted for information regarding known and recorded sites.

Attached is a list of Native American tribes who may also have knowledge of cultural resources in the project area. This list should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated; if they cannot supply information, they might recommend others with specific knowledge. By contacting all those listed, your organization will be better able to respond to claims of failure to consult with the appropriate tribe. If a response has not been received within two weeks of notification, the Commission requests that you follow-up with a telephone call or email to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from tribes, please notify the NAHC. With your assistance, we can assure that our lists contain current information. If you have any questions or need additional information, please contact me at my email address: steven.quinn@nahc.ca.gov.

Sincerely,

Steven Quinn

Steven Quinn
Associate Governmental Program Analyst

Attachment

Native American Heritage Commission
Native American Contact List
San Bernardino County
9/19/2019

Morongo Band of Mission Indians
Robert Martin, Chairperson
12700 Pumarra Rroad — Cahuilla, Serrano
Banning, CA, 92220
Phone: (951) 849 - 8807
Fax: (951) 922-8146
dtorres@morongo-nsn.gov

Morongo Band of Mission Indians
Denisa Torres, Cultural Resources Manager
12700 Pumarra Rroad — Cahuilla, Serrano
Banning, CA, 92220
Phone: (951) 849 - 8807
Fax: (951) 922-8146
dtorres@morongo-nsn.gov

San Fernando Band of Mission Indians
Donna Yocum, Chairperson
P.O. Box 221838 — Kitanemuk, Vanyume, Tataviam
Newhall, CA, 91322
Phone: (503) 539 - 0933
Fax: (503) 574-3308
ddyocum@comcast.net

San Manuel Band of Mission Indians
Lee Clauss, Director of Cultural Resources
26569 Community Center Drive — Serrano
Highland, CA, 92346
Phone: (909) 864 - 8933
Fax: (909) 864-3370
lclauss@sanmanuel-nsn.gov

Serrano Nation of Mission Indians
Wayne Walker, Co-Chairperson
P. O. Box 343 — Serrano
Patton, CA, 92369
Phone: (253) 370 - 0167
serranonation1@gmail.com

Serrano Nation of Mission Indians
Mark Cochrane, Co-Chairperson
P. O. Box 343 — Serrano
Patton, CA, 92369
Phone: (909) 528 - 9032
serranonation1@gmail.com

This list is current only as of the date of this document. Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resource Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources assessment for the proposed Fuel Center & Convenience Store Project, San Bernardino County.

From: Ryan Nordness <Ryan.Nordness@sanmanuel-nsn.gov>
Sent: Thursday, November 18, 2021 4:39 PM
To: ngallardo@crmtech.us
Subject: RE: Question for Project 3777

Hey Nina,

I conducted a quick search of our internal documents and yes, there is a known site within the APE. It looks to be the historical orchard, privy, and horticulture equipment that is visible on the surface.

Our concerns for this historic site is minimal but would likely still result in SMBMI consulting and including out preferred mitigation language.

> **From:** Nina Gallardo <ngallardo@crmtech.us>
> **Sent:** Thursday, November 18, 2021 4:09 PM
> **To:** Ryan Nordness <Ryan.Nordness@sanmanuel-nsn.gov>
> **Subject:** Question for Project 3777
>
> Hi Ryan,
>
> I'm sending over a topo map and an aerial map regarding the project we spoke about earlier today (blue is our current project and pink is the previous job). We are not conducting new NA work on this because we did one on an adjacent parcel in 2019. At that time, the Sacred Lands File search came back positive, and San Manuel stated that there were cultural resources near that PA but not in it. We wanted to check in to see if San Manuel had concerns for this project based on those past results. I would appreciate any help and/or information that you could provide to us at this time.
>
> Thanks again,
>
> Nina Gallardo
> CRM TECH
> (909) 824-6400

APPENDIX 3

CALIFORNIA HISTORICAL RESOURCES INVENTORY RECORD FORMS

State of California--The Resources Agency	Primary # 36-013546 (Update)
DEPARTMENT OF PARKS AND RECREATION	HRI #
CONTINUATION SHEET	Trinomial SBR-CA-12596H (Update)

Page 1 **of** 2 **Resource name or #** (Assigned by recorder)

Recorded by Salvadore Boites **Date** September 24, 2021 Continuation √ Update
Form Prepared by Salvadore Boites **Date** September 24, 2021
Affiliation: CRM TECH, Colton **Project No:** CRM TECH 3777

During an intensive-level archaeological field survey of Assessor's Parcel Number 0280-091-27 on September 24, 2021, it was observed that the olive grove recorded on this property in 2007 had been removed, leaving only a few scattered trees surviving today. On the adjacent property, the structural foundations and other features recorded in 2007 had also been removed. For all practical purposes, therefore, Site 36-013546 no longer exists. Aerial photographs available at the Nationwide Environmental Title Research (NETR) Online website (http://www.historicaerials.com) and through the Google Earth software indicate that the olive grove remained in place until sometime between April 2020 and April 2021.

Report Citation:

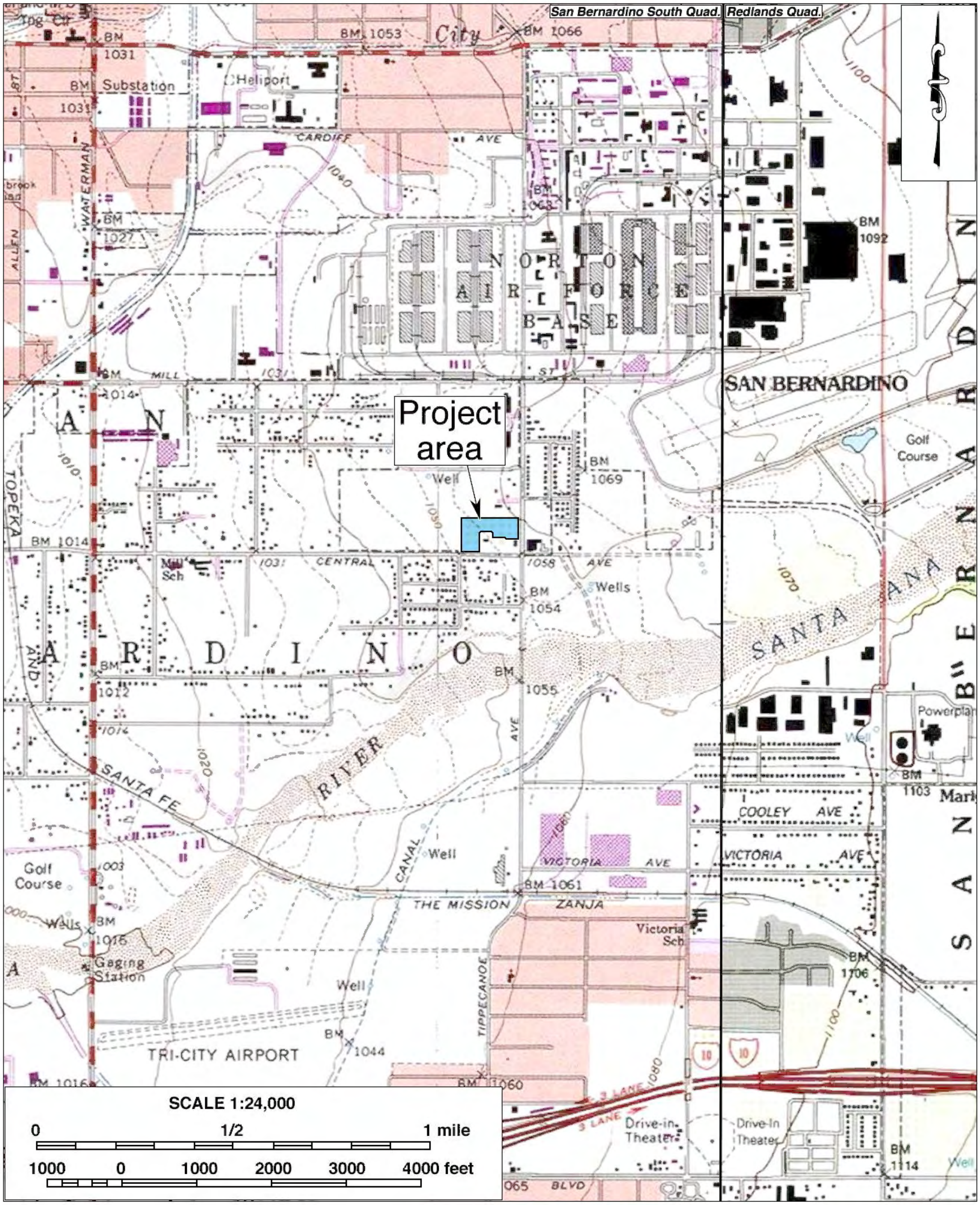
Bai "Tom" Tang, Deirdre Encarnación, and Salvadore Z. Boites
2021 Historical/Archaeological Resources Survey Report: CNG Fueling Station Project, Assessor's Parcel Number 0280-091-27, City of San Bernardino, San Bernardino County, California

State of California--The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary # 36-013546 (Update)
HRI #
Trinomial SBR-CA-12596H (Update)

Resource name or # (Assigned by recorder)

***Map Name:** San Bernardino South and Redlands, Calif.
***Scale:** 1:24,000 ***Date of Map:** 1980/1996



TRINOMIAL RECORDATION EVENTS

SBR- 12,596 H

P36-013,546

11/16/2006	SAN BDNO S	SHAVER	

1065 2021 8/07

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # 36-013546 H
HRI #
Trinomial CA-SBR-12596H
NRHP Status Code

Other Listings
Review Code Reviewer Date

 *Resource Name or #: JSA 1

P1. Other Identifier: APNs # 0280-091-26 and 0280-091-27

***P2. Location:** ☒Not for Publication ☐ Unrestricted *a. County: San Bernardino
and (P2b and P2c or P2d. Attach a Location Map as necessary.) SE/NE Sec 14

*b. USGS 7.5' Quad: *San Bernardino, South* 7.5' series quad Date: 1967(PR 1980) T1S; R4W,Rancho San Bernardino; SB B.M.

c. Address: 1130 Central Avenue City: San Bernardino Zip: 92408

d. UTM: Zone: 11; 475895 mE/ 3771535 mN (NAD 27)
476100 mE/ 3771518 mN
475888 mE/ 3771662 mN
476103 mE/ 3771664 mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)
From Interstate 10, exit at Tippecanoe Avenue and head north for approximately 1.5 miles to Central Avenue. Turn west on Central Avenue and continue for approximately 150 feet. The site is located on the north side of Central Avenue on APN#s 0280-091-26 and 0280-091-27. A juniper tree was used as site datum . The datum coordinates are 475972mE / 3771561mN (NAD 27).

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
This 500 feet x 800 feet (7.7-acre) historical archaeological site includes an olive grove with over 300 trees (6.8 acres) and a 150 feet by 300 feet (Locus A; 0.9 acre). Locus A is located on APN # 0280-091-27 and consists of two concrete slab foundations (one residential and one outbuilding), a poured concrete pond, ornamental vegetation including pepper and fir trees, and four large debris piles containing construction materials from recently demolished buildings. Construction materials observed included: whitewashed adobe bricks, a segment of a whitewashed adobe wall, plywood, segments of decorative (red and yellow) tile countertops, a segment of a brick fireplace, fired (red) brick, and window glass.

P3b. Resource Attributes: (List attributes and codes) AH2, AH3, AH4

***P4. Resources Present:** ☐Building ☐Structure ☐Object ☒Site ☐District ☐Element of District ☐Other (Isolates, etc.)

P5b. Description of Photo: (View, date, accession #) Site overview, view north, 11/16/06

***P6. Date Constructed/Age and Sources:** ☒Historic ☐Prehistoric ☐Both

***P7. Owner and Address:**
Central Avenue Trust
Address unknown

***P8. Recorded by:** (Name, affiliation, and address)
Noelle C.S. Shaver and
Christopher L. Shaver of
Jones & Stokes
42145 Lyndie Lane, Suite 200
Temecula, CA 92591

***P9. Date Recorded:**
November 16, 2006 and January 25, 2007

***P10. Survey Type:** (Describe) Intensive

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.") 2007 Shaver, Noelle C.S. *A Phase I Historical Resources Study for the Central Avenue Improvements Project, City of San Bernardino, San Bernardino County, CA.* .

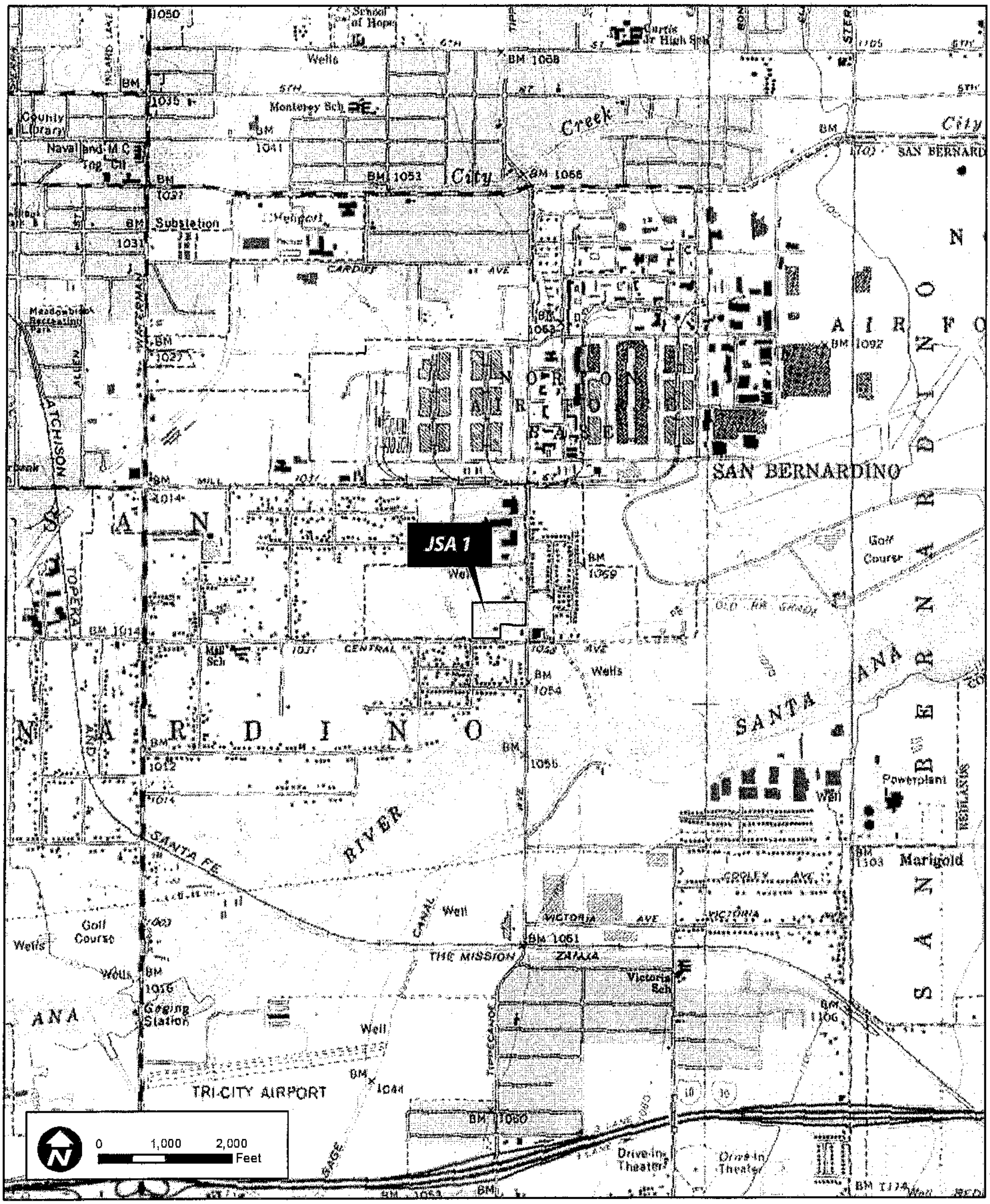
***Attachments:** ☐NONE ☒Location Map ☒Sketch Map ☒Continuation Sheet ☐Building, Structure, and Object Record ☒Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary # 36-013546
HRI#
Trinomial SBR-12596H

*Resource Name or #: JSA 1

*Map Name: San Bernardino South, Calif., Redlands, Calif. 7.5'- series Quadrangles *Scale: 1: 24000 *Date of Map: 1980, 1996



*Required information

***Resource Name or #:** JSA 1

***A1. Dimensions: a. Length:** 800 feet (E/W) × **b. Width:** 500 feet (N/S)
Method of Measurement: Paced Taped [X] Visual estimate Other:
Method of Determination (Check any that apply.): [X] Artifacts Features Soil [X] Vegetation Topography Cut bank Animal burrow Excavation [X] Property boundary Other (Explain):
Reliability of Determination: [X] High Medium Low Explain:
Limitations (Check any that apply): [X] Restricted access Paved/built over Site limits incompletely defined Disturbances Vegetation Other (Explain): Access onto the parcels containing the grove was restricted.

A2. Depth: None [X] Unknown Method of Determination:

***A3. Human Remains:** Present Absent Possible [X] Unknown (Explain): Not tested

***A4. Features** (Number, briefly describe, indicate size, list associated cultural constituents, and show location of each feature on sketch map.): Three features were observed in Locus A including two concrete foundations and a decorative poured concrete pond. Feature 1 is the largest of the three features and measures 37 feet (E/W) x 33 feet (N/S). This feature is the foundation of a residence that once existed at this address. Feature 2 is concrete slab foundation measuring 23 feet E/W x 20.5 feet (N/S) and appears to have been an outbuilding. Feature 3 is an amorphous-shaped, cobble-lined, poured concrete pond measuring 11 feet (NW/SE) x 25 feet (NE/SW) that is painted light blue.

***A5. Cultural Constituents** (Describe and quantify artifacts, ecofacts, cultural residues, etc., not associated with features.): Iindividual adobe bricks with ¼".whitewash on both sides, a whitewashed adobe wall segment, cinder blocks, fired (red) bricks, milled lumber, plywood pieces, linoleum segments, kitchen/bath tile countertop, cut nails (see continuation sheet).

***A6. Were Specimens Collected?** [X] No Yes (If yes, attach Artifact Record or catalog and identify where specimens are curated.)

***A7. Site Condition:** [X] Good Fair Poor:

***A8. Nearest Water** (Type, distance, and direction.): Santa Ana River is located ½ of a mile south

***A9. Elevation:** 1,050 feet

A10. Environmental Setting (Describe culturally relevant variables such as vegetation, fauna, soils, geology, landform, slope, aspect, exposure, etc.): The site is located on the Santa Ana River floodplain. Soils consisted of Tujunga gravelly loamy sand (Woodruff and Brock 1980). Vegetation consisted of annual grasses, ruderal vegetation, and ornamentals including pepper, and juniper trees.

A11. Historical Information: Assessor's records indicate that APNs # 0280-091-020, -23, -26, and -27 were assessed from 1895 until 1935 as one 10-acre parcel under the ownership of G.A. Atwood. No improvements are listed on the parcel between 1895 and 1917. However, between 1918 and 1922, a $400 "vine/trees" improvement is included in the assessment. Although the value of the "vine/trees" improvement fluctuates through the years, it continues to be listed in the property. An historic aerial photograph shows that a grove/orchard covered parcels 0280-91-20, -23, -26, and -27 by 1938. The grove begins to recede north from Central Avenue on parcels 0280-091-20 and 0280-091-23 by 1969 and continues to recede through the years until it sits as it is today (on parcel 0280-091-027 exclusively). (see continuation sheet)

***A12. Age:** Prehistoric Protohistoric 1542-1769 1769-1848 1848-1880 [X] 1880-1914 [X] 1914-1945 [X] Post 1945 Undetermined Describe position in regional prehistoric chronology or factual historic dates if known:

A13. Interpretations (Discuss data potential, function[s], ethnic affiliation, and other interpretations): N/A

A14. Remarks: According to aerial photographs, the residential complex was demolished sometime after 2003 (Google Earth 2006)

A15. References (Documents, informants, maps, and other references):

Woodrff, George A. and Willie Z. Brock
1980 Soil Survey of San Bernardino County, Southwestern Part, California. United States Department of Agriculture Soil Conservation Service and the University of California Agricultural Experiment Station.

Google Earth Beta (v4.0.20XX)
2006 Aerial photograph of Central Avenue area dated 2003.

A16. Photographs (List subjects, direction of view, and accession numbers or attach a Photograph Record.):
Original Media/Negatives Kept at: Jones & Stokes, 42145 Lyndie Lane, Suite 200, Temecula, CA

***A17. Form Prepared by:** Noelle C.S. Shaver **Date:** February 15, 2007
Affiliation and Address: Jones & Stokes, 42145 Lyndie Lane, Suite 200, Temecula, CA 92591

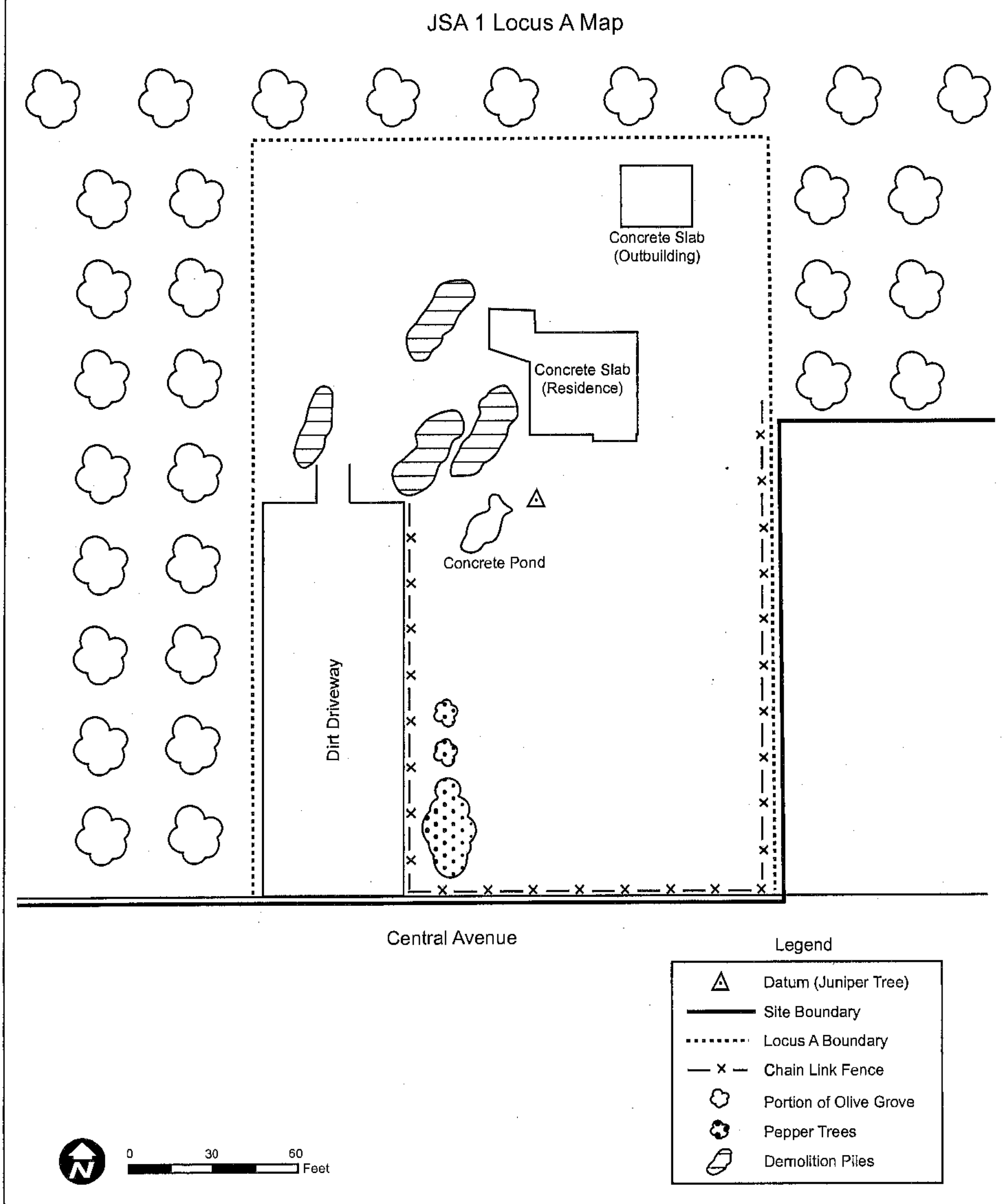
State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

SKETCH MAP

Primary # 36-013546
HRI#
Trinomial SBR-12596H

 *Resource Name or #: JSA 1

*Drawn By: Noelle C.S. Shaver *Date: 2/23/07

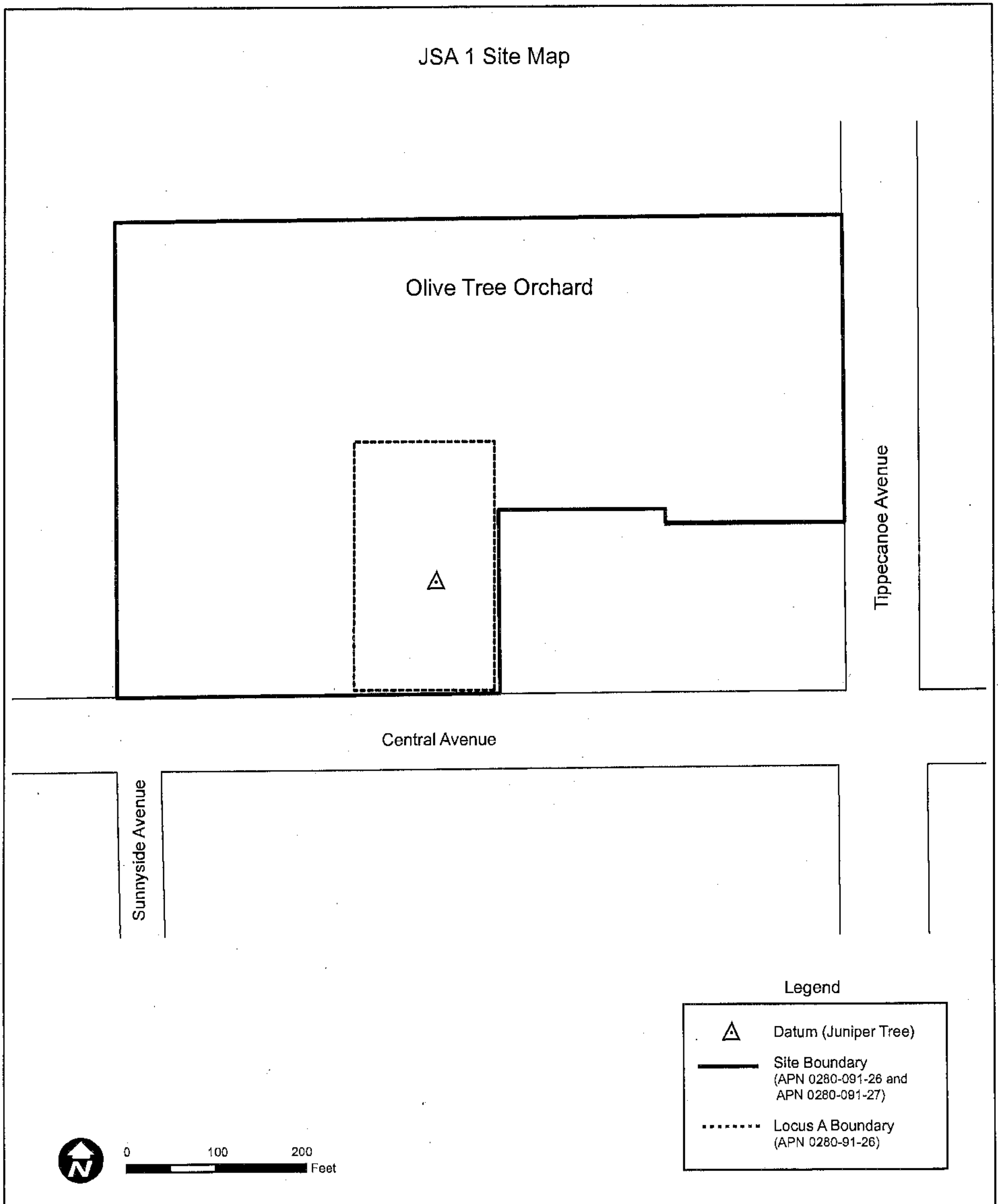


State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary # 36-013546
HRI#
Trinomial SBR-12596H

 *Resource Name or #: JSA 1

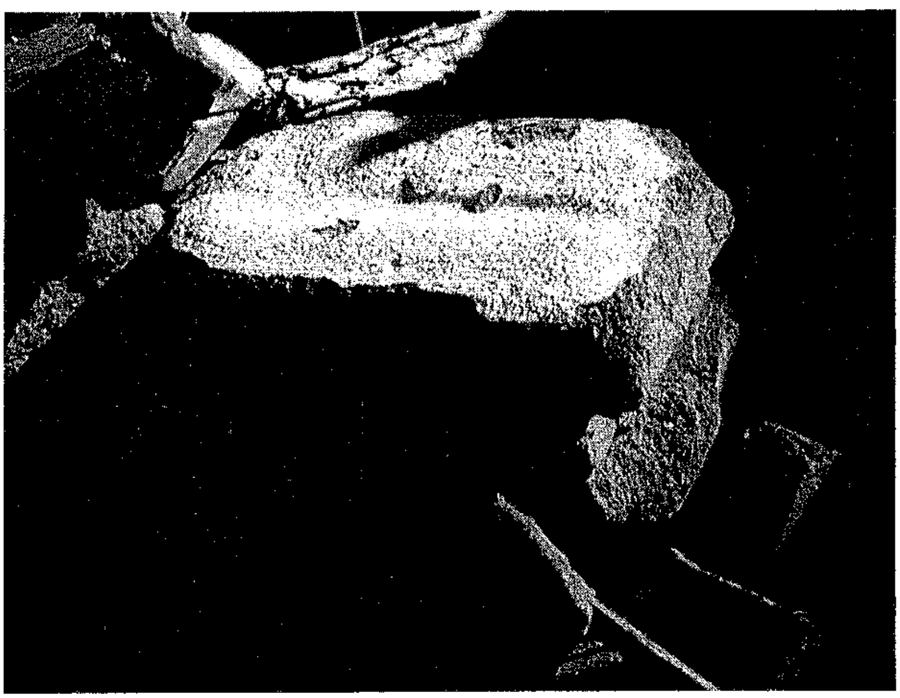
*Drawn By: Chris Shaver *Date: 2/23/07



A5 Cultural Constituents Cont: Individual adobe bricks identified in situ measured an average of 4"(D) x 8" (W) x 15 ¾" (L). Brick soils consisted of sub-angular decomposing granite with poorly to fine sub-angular pebbles measuring no greater than 6mm. In a comparison of the soil to the Munsell chart, the bricks appeared to be created from soil with a hue of 10YR and a value/chroma of 5/3. Two small construction nails were also identified in one of the isolated adobe bricks. These nails were each cut 2d nails (2 pennyweight) (IMACS 1992). The top surface of the cylindrical heads measured ¼" in diameter and were textured (striated). Underneath the head, the first ¼" of the body was cylindrical while the remaining ¾" tapers on four sides of the shank toward the point. In addition, the intact wall segment was treated with a ¼" exterior whitewash and the bricks were lain within a ½" thick concrete mortar bed.

A11 Historical InformationCont: In 1935, ownership of the 10-acre property is transferred to Alice R. Atwood from Mr. Atwood. Mrs. Atwood sold 9 of the 10 acres to H.J. and Lillian E. Esselman in 1939 (the remaining acre appears to have been, and remain, a water easement). In 1940, a $400 building improvement was included in the Esselman property assessment (APN 0280-091-26). This date is consistent with (1) the current assessor's 1940 building date for the demolished residence and (2) is further corroborated by the lack of construction on the 1938 aerial but a visible residence and outbuilding on the 1955 aerial. Therefore, it appears the property was purchased in the late 19th century and maintained as a single agricultural parcel by the Atwood family until it was sold to H.J. and Lillian Esselman in 1939. In 1940, the Esselman's constructed a home in 1940.

Site overview including two demolition piles, facing north



Whitewashed adobe brick in demolition pile

Concrete slab foundation (residence), facing east

Poured concrete pool, facing north

APPENDIX 4

Soil Map—San Bernardino County Southwestern Part, California
(HA-125)

Map Scale: 1:1,370 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 20, 40, 80, 120

Feet: 0, 50, 100, 200, 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 10, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 1, 2018—Jun 30, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
TvC	Tujunga gravelly loamy sand, 0 to 9 percent slopes	9.7	100.0%
Totals for Area of Interest		**9.7**	**100.0%**

APPENDIX 5

Water Quality Management Plan

For:

Clean Energy

E. Central Avenue & Tippecanoe Avenue

San Bernardino, CA

Prepared for:

Clean Energy

4675 Mac Arthur Court, Ste. 800

Newport Beach, CA, 92660

949.437.1000

Prepared by:

Site Design Collaborative

245 East Third Street

Long Beach, CA 90802

800.484.4717

Submittal Date: **09/28/2021**

Revision Date: ___________

Approval Date: _____________________

Project Owner's Certification

This Water Quality Management Plan (WQMP) has been prepared for Clean Energy by Site Design Collaborative. The WQMP is intended to comply with the requirements of the City of San Bernardino and the NPDES Areawide Stormwater Program requiring the preparation of a WQMP. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with San Bernardino County's Municipal Storm Water Management Program and the intent of the NPDES Permit for San Bernardino County and the incorporated cities of San Bernardino County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors in interest and the city/county shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity.

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors."

.

Project Data			
Permit/Application Number(s):	TBD	Grading Permit Number(s):	TBD
Tract/Parcel Map Number(s):		Building Permit Number(s):	N/A
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			0280-091-027

Owner's Signature			
Owner Name: Linda Green Alshuler			
Title	Managing Member		
Company	MLG SD Land LLC, a California LLC		
Address	2182 Vista Entrada, Newport Beach CA 92660		
Email	johnalshuler@gmail.com		
Telephone #	714-812-0011		
Signature		Date	

Preparer's Certification

Project Data			
Permit/Application Number(s):	TBD	Grading Permit Number(s):	TBD
Tract/Parcel Map Number(s):	N/A	Building Permit Number(s):	TBD
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			0280-091-027

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan were prepared under my oversight and meet the requirements of Regional Water Quality Control Board Order No. R8-2010-0036."

Engineer: Farman Shir, PE		PE Stamp Below
Title	Principal	
Company	Site Design Collaborative	
Address	245 East THird Street, Long Beach, CA 90802	
Email	fshir@sdcollaborative.net	
Telephone #	800.484.4717	
Signature		
Date		

Table of Contents

Forms

Section 1 Discretionary Permit(s)

<table>
<tr><th colspan="8">Form 1-1 Project Information</th></tr>
<tr><td colspan="2">Project Name</td><td colspan="6">Clean Energy</td></tr>
<tr><td colspan="2">Project Owner Contact Name:</td><td colspan="6">Linda Green Alshuler</td></tr>
<tr><td>Mailing Address:</td><td colspan="2">2182 Vista Entrada, Newport Beach CA 92660</td><td>E-mail Address:</td><td>johnalshuler@gmail.com</td><td>Telephone:</td><td colspan="2">714-812-0011</td></tr>
<tr><td colspan="2">Permit/Application Number(s):</td><td colspan="2">TBD</td><td>Tract/Parcel Map Number(s):</td><td colspan="3">APN: 0280-091-027</td></tr>
<tr><td colspan="2">Additional Information/ Comments:</td><td colspan="6"></td></tr>
<tr><td colspan="2">Description of Project:</td><td colspan="6">The subject site consists of a gated parking to the north on 5 acres with a equipment and short fueling station to the southwest of the site on 1.75 acres. Proposed overland runoff sheets flows generally in a southwesterly direction. The site is not subjected to off-site runon.
The proposed project will comprise of a single drainage management area with treatment of two infiltration basins. Both will discharge any excess runoff through a storm drain line that leads to the street curb face parkway drain on East Central Ave.
The site is exempt from HCOC mitigation</td></tr>
<tr><td colspan="2">Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.</td><td colspan="6">N/A</td></tr>
</table>

Section 2 Project Description

2.1 Project Information

This section of the WQMP should provide the information listed below. The information provided for Conceptual/ Preliminary WQMP should give sufficient detail to identify the major proposed site design and LID BMPs and other anticipated water quality features that impact site planning. Final Project WQMP must specifically identify all BMP incorporated into the final site design and provide other detailed information as described herein.

The purpose of this information is to help determine the applicable development category, pollutants of concern, watershed description, and long term maintenance responsibilities for the project, and any applicable water quality credits. This information will be used in conjunction with the information in Section 3, Site Description, to establish the performance criteria and to select the LID BMP or other BMP for the project or other alternative programs that the project will participate in, which are described in Section 4.

Form 2.1-1 Description of Proposed Project

1 Development Category (Select all that apply):			
☐ Significant re-development involving the addition or replacement of 5,000 ft^2 or more of impervious surface on an already developed site	☒ New development involving the creation of 10,000 ft^2 or more of impervious surface collectively over entire site	☐ Automotive repair shops with standard industrial classification (SIC) codes 5013, 5014, 5541, 7532- 7534, 7536-7539	☐ Restaurants (with SIC code 5812) where the land area of development is 5,000 ft^2 or more
☐ Hillside developments of 5,000 ft^2 or more which are located on areas with known erosive soil conditions or where the natural slope is 25 percent or more	☐ Developments of 2,500 ft^2 of impervious surface or more adjacent to (within 200 ft) or discharging directly into environmentally sensitive areas or waterbodies listed on the CWA Section 303(d) list of impaired waters.	☒ Parking lots of 5,000 ft^2 or more exposed to storm water	☐ Retail gasoline outlets that are either 5,000 ft^2 or more, or have a projected average daily traffic of 100 or more vehicles per day
☐ Non-Priority / Non-Category Project *May require source control LID BMPs and other LIP requirements. Please consult with local jurisdiction on specific requirements*.			

2 Project Area (ft2):	277,030	3 Number of Dwelling Units:	N/A	4 SIC Code:	7521

5 Is Project going to be phased? Yes ☐ No ☒ *If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.*
6 Does Project include roads? Yes ☐ No ☒ *If yes, ensure that applicable requirements for transportation projects are addressed (see Appendix A of TGD for WQMP)*

2.2 Property Ownership/Management

Describe the ownership/management of all portions of the project and site. State whether any infrastructure will transfer to public agencies (City, County, Caltrans, etc.) after project completion. State if a homeowners or property owners association will be formed and be responsible for the long-term maintenance of project stormwater facilities. Describe any lot-level stormwater features that will be the responsibility of individual property owners.

Form 2.2-1 Property Ownership/Management
Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities:
Clean Energy Fuels 4675 MacArthur Court, Suite 800 Newport Beach, CA 92660 949-437-1000

2.3 Potential Stormwater Pollutants

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-3 in the TGD for WQMP).

Form 2.3-1 Pollutants of Concern			
Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	Animal wastes
Nutrients - Phosphorous	E ☒	N ☐	Fertilizers, Landscape maintenance activities
Nutrients - Nitrogen	E ☒	N ☐	Fertilizers, Landscape maintenance activities
Noxious Aquatic Plants	E ☐	N ☒	N/A
Sediment	E ☒	N ☐	Debris and runoff from planter areas
Metals	E ☒	N ☐	Automobiles in the form of tread wear and brake pads
Oil and Grease	E ☒	N ☐	Automobile use such as leaks
Trash/Debris	E ☒	N ☐	Debris from offsite-blown-on
Pesticides / Herbicides	E ☒	N ☐	Landscaping and maintenance activities
Organic Compounds	E ☒	N ☐	Landsacping maintenance activities
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

2.4 Water Quality Credits

A water quality credit program is applicable for certain types of development projects if it is not feasible to meet the requirements for on-site LID. Proponents for eligible projects, as described below, can apply for water quality credits that would reduce project obligations for selecting and sizing other treatment BMP or participating in other alternative compliance programs. Refer to Section 6.2 in the TGD for WQMP to determine if water quality credits are applicable for the project.

Form 2.4-1 Water Quality Credits			
1 Project Types that Qualify for Water Quality Credits: *Select all that apply*			
☐ Redevelopment projects that reduce the overall impervious footprint of the project site. [Credit = % impervious reduced]	Higher density development projects ☐Vertical density [20%] ☐7 units/ acre [5%]	☐ Mixed use development, (combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that demonstrate environmental benefits not realized through single use projects) [20%]	☐Brownfield redevelopment (redevelop real property complicated by presence or potential of hazardous contaminants) [25%]
☐ Redevelopment projects in established historic district, historic preservation area, or similar significant core city center areas [10%]	☐ Transit-oriented developments (mixed use residential or commercial area designed to maximize access to public transportation) [20%]	☐ In-fill projects (conversion of empty lots & other underused spaces < 5 acres, substantially surrounded by urban land uses, into more beneficially used spaces, such as residential or commercial areas) [10%]	☐ Live-Work developments (variety of developments designed to support residential and vocational needs) [20%]
2 Total Credit % 0% *(Total all credit percentages up to a maximum allowable credit of 50 percent)*			
Description of Water Quality Credit Eligibility (if applicable)			

Section 3 Site and Watershed Description

Describe the project site conditions that will facilitate the selection of BMP through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and sub-watershed DMAs) is conveyed to the site outlet(s). Refer to Section 3.2 in the TGD for WQMP. The form below is provided as an example. Then complete Forms 3.2 and 3.3 for each DA on the project site. ***If the project has more than one drainage area for stormwater management, then complete additional versions of these forms for each DA / outlet.***

Form 3-1 Site Location and Hydrologic Features

Site coordinates *take GPS measurement at approximate center of site*	Latitude 34°05'13.0"N	Longitude 117°15'39.9"W	Thomas Bros Map page 577
1 San Bernardino County climatic region: ☒ Valley ☐ Mountain			
2 Does the site have more than one drainage area (DA): Yes ☐ No ☒ *If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached*			

Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1				
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D
1 DMA drainage area (ft^2)	157,680	119,350		
2 Existing site impervious area (ft^2)	0	0		
3 Antecedent moisture condition *For desert areas, use* *http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	II	II		
4 Hydrologic soil group *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	A	A		
5 Longest flowpath length (ft)	380	400		
6 Longest flowpath slope (ft/ft)	0.01	0.01		
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Orchard	Orchard		
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating*	75%	75%		

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1 (use only as needed for additional DMA w/in DA 1)				
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA E	DMA F	DMA G	DMA H
1 DMA drainage area (ft^2)				
2 Existing site impervious area (ft^2)				
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*				
4 Hydrologic soil group *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*				
5 Longest flowpath length (ft)				
6 Longest flowpath slope (ft/ft)				
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*				
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating*				

Form 3-3 Watershed Description for Drainage Area

Receiving waters *Refer to Watershed Mapping Tool - http://permitrack.sbcounty.gov/wap/* *See 'Drainage Facilities" link at this website*	Street and local storm drains. Santa Ana River Reach 5 - 4
Applicable TMDLs *Refer to Local Implementation Plan*	Santa Ana River Reach 3: Pathogens, Nitrates
303(d) listed impairments *Refer to Local Implementation Plan and Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/ and State Water Resources Control Board website – http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/index.shtml*	Santa Ana River Reach 4: Indicator Bacteria Santa Ana River Reach 3: Indicator Bacteria, Copper, Lead
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	San Bernardino Kangaroo Rat
Unlined Downstream Water Bodies *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	Yes – Santa Ana River
Hydrologic Conditions of Concern	☐ Yes *Complete Hydrologic Conditions of Concern (HCOC) Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-10 in submittal* ☒ No
Watershed–based BMP included in a RWQCB approved WAP	☐ Yes *Attach verification of regional BMP evaluation criteria in WAP* • *More Effective than On-site LID* • *Remaining Capacity for Project DCV* • *Upstream of any Water of the US* • *Operational at Project Completion* • *Long-Term Maintenance Plan* ☒ No

Section 4 Best Management Practices (BMP)

4.1 Source Control BMP

4.1.1 Pollution Prevention

Non-structural and structural source control BMP are required to be incorporated into all new development and significant redevelopment projects. Form 4.1-1 and 4.1-2 are used to describe specific source control BMPs used in the WQMP or to explain why a certain BMP is not applicable. Table 7-3 of the TGD for WQMP provides a list of applicable source control BMP for projects with specific types of potential pollutant sources or activities. The source control BMP in this table must be implemented for projects with these specific types of potential pollutant sources or activities.

The preparers of this WQMP have reviewed the source control BMP requirements for new development and significant redevelopment projects. The preparers have also reviewed the specific BMP required for project as specified in Forms 4.1-1 and 4.1-2. All applicable non-structural and structural source control BMP shall be implemented in the project.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	☒	☐	Tenants and employees will be provided with commercial property BMP brochures
N2	Activity Restrictions	☒	☐	No dumping of household chemicals, plants, etc.
N3	Landscape Management BMPs	☒	☐	Maintenance personnel to be provided with Landscape Maintenance BMP brochures
N4	BMP Maintenance	☒	☐	Personnel will be provided with household BMP in Section 6
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	No hazardous waster will be used on-site
N6	Local Water Quality Ordinances	☒	☐	Title 8, Chapter 8.80, implemented via the provisions of this WQMP
N7	Spill Contingency Plan	☒	☐	A spill cleanup and disposal process shall be created, and all applicable employees shall be trained accordingly
N8	Underground Storage Tank Compliance	☒	☐	Will comply with all regulations
N9	Hazardous Materials Disclosure Compliance	☒	☐	Handled and disposed of per all applicable regulations

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N10	Uniform Fire Code Implementation	☒	☐	Hazardous material will be handled and disposed of per all applicable regulations
N11	Litter/Debris Control Program	☒	☐	Regular landscape maintenance by owner
N12	Employee Training	☒	☐	Maintenance personnel to be provided with training upon hiring and annually thereafter
N13	Housekeeping of Loading Docks	☐	☒	No loading docks
N14	Catch Basin Inspection Program	☒	☐	Catch bains to be inspected and cleaned regularly as part of routine maintenance
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	Parking lots to be vacuum swept as part of routine maintenance, not less than once monthly
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	N/A
N17	Comply with all other applicable NPDES permits	☒	☐	A SWPPP will be prepared and implemented during construction

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	To be stenciled with "NO DUMPING, DRAINS TO OCEAN"
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	No outdoor storage areas
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	Trash Enclosures to be designed per City standard and to eliminate the potential for flow running through area
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	☒	☐	Efficient irrigation to be installed on lots.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	Where not in conflict with ADA requirements
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☒	☐	All areas will be stabilized with hardscape and/or landscape
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☐	☒	No covered docks
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	No Covered maintenance bays
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☒	☐	Vehicle wash areas will be self-contained.
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	No covered outdoor processing areas.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No equipment wash areas
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☒	☐	Run-on will be prevented in all fueling areas.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	No hillside areas
S14	Wash water control for food preparation areas	☐	☒	No outdoor food preparation areas
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	No community car wash racks

4.1.2 Preventative LID Site Design Practices

Site design practices associated with new LID requirements in the MS4 Permit should be considered in the earliest phases of a project. Preventative site design practices can result in smaller DCV for LID BMP and hydromodification control BMP by reducing runoff generation. Describe site design and drainage plan including:

- A narrative of site design practices utilized or rationale for not using practices
- A narrative of how site plan incorporates preventive site design practices
- Include an attached Site Plan layout which shows how preventative site design practices are included in WQMP

Refer to Section 5.2 of the TGD for WQMP for more details.

Form 4.1-3 Preventative LID Site Design Practices Checklist
Site Design Practices *If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets*
Minimize impervious areas: Yes ☒ No ☐ Explanation: Driveway's width have been reduced. Landscaping area exceeds typical commercial development
Maximize natural infiltration capacity: Yes ☒ No ☐ Explanation: Infiltration basins are proposed
Preserve existing drainage patterns and time of concentration: Yes ☒ No ☐ Explanation: Drainage patterns are unchanged
Disconnect impervious areas: Yes ☒ No ☐ Explanation: Lot runoff drains to the infiltration basins prior to discharge to existing curb flow line
Protect existing vegetation and sensitive areas: Yes ☐ No ☒ Explanation: No existing sensitive areas to protect.
Re-vegetate disturbed areas: Yes ☒ No ☐ Explanation: Landscaping will be installed throughout the property
Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: Compaction to be minimized in basins to maximize the potential for infiltration
Utilize vegetated drainage swales in place of underground piping or imperviously lined swales: Yes ☐ No ☒ Explanation: Site drains to infiltration basins.
Stake off areas that will be used for landscaping to minimize compaction during construction : Yes ☒ No ☐ Explanation: Infiltration basins will be staked off to prohibit compaction of that area

4.2 Project Performance Criteria

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in the MS4 Permit. These targets include runoff volume for water quality control (referred to as LID design capture volume), and runoff volume, time of concentration, and peak runoff for protection of any downstream waterbody segments with a HCOC. ***If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.***

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), the San Bernardino County Stormwater Program requires use of the P_6 method (MS4 Permit Section XI.D.6a.ii) – Form 4.2-1
- For HCOC pre- and post-development hydrologic calculation, the San Bernardino County Stormwater Program requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi^2), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for HCOC performance criteria.

Refer to Section 4 in the TGD for WQMP for detailed guidance and instructions.

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)		
1 Project area DA 1 (ft^2): 277,030	2 Imperviousness after applying preventative site design practices (Imp%): 90%	3 Runoff Coefficient (Rc): _0.73 *R_c = 0.858(Imp%)^3-0.78(Imp%)^2+0.774(Imp%)+0.04*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.498 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.74 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*		
6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
7 Compute design capture volume, DCV (ft^3): 24,480 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

Form 4.2-2 Summary of HCOC Assessment (DA 1)

Does project have the potential to cause or contribute to an HCOC in a downstream channel: Yes ☐ No ☒

Go to: *http://permitrack.sbcounty.gov/wap/*

If "Yes", then complete HCOC assessment of site hydrology for 2yr storm event using Forms 4.2-3 through 4.2-5 and insert results below

(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual)

If "No," then proceed to Section 4.3 Project Conformance Analysis

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** *Form 4.2-3 Item 12*	**2** *Form 4.2-4 Item 13*	**3** *Form 4.2-5 Item 10*
Post-developed	**4** *Form 4.2-3 Item 13*	**5** *Form 4.2-4 Item 14*	**6** *Form 4.2-5 Item 14*
Difference	**7** *Item 4 – Item 1*	**8** *Item 2 – Item 5*	**9** *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** *%* *Item 7 / Item 1*	**11** *%* *Item 8 / Item 2*	**12** *%* *Item 9 / Item 3*

Form 4.2-3 HCOC Assessment for Runoff Volume (DA 1)

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1a Land Cover type								
2a Hydrologic Soil Group (HSG)								
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type								
2b Hydrologic Soil Group (HSG)								
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								

5 Pre-Developed area-weighted CN:	**7** Pre-developed soil storage capacity, S (in): *S = (1000 / Item 5) - 10*	**9** Initial abstraction, I_a (in): *I_a = 0.2 * Item 7*
6 Post-Developed area-weighted CN:	**8** Post-developed soil storage capacity, S (in): *S = (1000 / Item 6) - 10*	**10** Initial abstraction, I_a (in): *I_a = 0.2 * Item 8*

11 Precipitation for 2 yr, 24 hr storm (in):
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

12 Pre-developed Volume (ft^3):
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*

13 Post-developed Volume (ft^3):
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*

14 Volume Reduction needed to meet HCOC Requirement, (ft^3):
*V_{HCOC} = (Item 13 * 0.95) – Item 12*

Form 4.2-4 HCOC Assessment for Time of Concentration (DA 1)

Compute time of concentration for pre and post developed conditions for each DA *(For projects using the Hydrology Manual complete the form below)*

Variables	Pre-developed DA1 *Use additional forms if there are more than 4 DMA*				Post-developed DA1 *Use additional forms if there are more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) *Use Form 3-2 Item 5 for pre-developed condition*								
2 Change in elevation (ft)								
3 Slope (ft/ft), *S_o = Item 2 / Item 1*								
4 Land cover								
5 Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP*								
6 Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet*								
7 Cross-sectional area of channel (ft^2)								
8 Wetted perimeter of channel (ft)								
9 Manning's roughness of channel (n)								
10 Channel flow velocity (ft/sec) *V_{fps} = (1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5*								
11 Travel time to outlet (min) *T_t = Item 6 / (Item 10 * 60)*								
12 Total time of concentration (min) *T_c = Item 5 + Item 11*								
13 Pre-developed time of concentration (min): *Minimum of Item 12 pre-developed DMA*								
14 Post-developed time of concentration (min): *Minimum of Item 12 post-developed DMA*								
15 Additional time of concentration needed to meet HCOC requirement (min): *$T_{C\text{-}HCOC}$ = (Item 13 * 0.95) – Item 14*								

Form 4.2-5 HCOC Assessment for Peak Runoff (DA 1)

Compute peak runoff for pre- and post-developed conditions

Variables	Pre-developed DA to Project Outlet (*Use additional forms if more than 3 DMA*)			Post-developed DA to Project Outlet (*Use additional forms if more than 3 DMA*)		
	DMA A	DMA B	DMA C	DMA A	DMA B	DMA C
1 Rainfall Intensity for storm duration equal to time of concentration *I_{peak} = 10^(LOG Form 4.2-1 Item 4 - 0.6 LOG Form 4.2-4 Item 5 /60)*						
2 Drainage Area of each DMA (Acres) *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*						
3 Ratio of pervious area to total area *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*						
4 Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*						
5 Maximum loss rate (in/hr) *F_m = Item 3 * Item 4* *Use area-weighted F_m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*						
6 Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*						
7 Time of concentration adjustment factor for other DMA to site discharge point *Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)* — DMA A	*n/a*			*n/a*		
DMA B		*n/a*			*n/a*	
DMA C			*n/a*			*n/a*

8 Pre-developed Q_p at T_c for DMA A:
*Q_p = Item 6_{DMAA} + [Item 6_{DMAB} * (Item 1_{DMAA} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAA/2}$] + [Item 6_{DMAC} * (Item 1_{DMAA} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAA/3}$]*

9 Pre-developed Q_p at T_c for DMA B:
*Q_p = Item 6_{DMAB} + [Item 6_{DMAA} * (Item 1_{DMAB} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAB/1}$] + [Item 6_{DMAC} * (Item 1_{DMAB} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAB/3}$]*

10 Pre-developed Q_p at T_c for DMA C:
*Q_p = Item 6_{DMAC} + [Item 6_{DMAA} * (Item 1_{DMAC} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAC/1}$] + [Item 6_{DMAB} * (Item 1_{DMAC} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAC/2}$]*

10 Peak runoff from pre-developed condition confluence analysis (cfs): *Maximum of Item 8, 9, and 10 (including additional forms as needed)*

11 Post-developed Q_p at T_c for DMA A: *Same as Item 8 for post-developed values*

12 Post-developed Q_p at T_c for DMA B: *Same as Item 9 for post-developed values*

13 Post-developed Q_p at T_c for DMA C: *Same as Item 10 for post-developed values*

14 Peak runoff from post-developed condition confluence analysis (cfs): *Maximum of Item 11, 12, and 13 (including additional forms as needed)*

15 Peak runoff reduction needed to meet HCOC Requirement (cfs): *$Q_{p\text{-}HCOC}$ = (Item 14 * 0.95) – Item 10*

4.3 Project Conformance Analysis

Complete the following forms for each project site DA to document that the proposed LID BMPs conform to the project DCV developed to meet performance criteria specified in the MS4 Permit (WQMP Template Section 4.2). For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the MS4 Permit (see Section 5.3.1 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design and Hydrologic Source Controls (Form 4.3-2)
- Retention and Infiltration (Form 4.3-3)
- Harvested and Use (Form 4.3-4) or
- Biotreatment (Form 4.3-5).

At the end of each form, additional fields facilitate the determination of the extent of mitigation provided by the specific BMP category, allowing for use of the next category of BMP in the hierarchy, if necessary.

The first step in the analysis, using Section 5.3.2.1 of the TGD for WQMP, is to complete Forms 4.3-1 and 4.3-3) to determine if retention and infiltration BMPs are infeasible for the project. For each feasibility criterion in Form 4.3-1, if the answer is "Yes," provide all study findings that includes relevant calculations, maps, data sources, etc. used to make the determination of infeasibility.

Next, complete Forms 4.3-2 and 4.3-4 to determine the feasibility of applicable HSC and harvest and use BMPs, and, if their implementation is feasible, the extent of mitigation of the DCV.

If no site constraints exist that would limit the type of BMP to be implemented in a DA, evaluate the use of combinations of LID BMPs, including all applicable HSC BMPs to maximize on-site retention of the DCV. If no combination of BMP can mitigate the entire DCV, implement the single BMP type, or combination of BMP types, that maximizes on-site retention of the DCV within the minimum effective area.

If the combination of LID HSC, retention and infiltration, and harvest and use BMPs are unable to mitigate the entire DCV, then biotreatment BMPs may be implemented by the project proponent. If biotreatment BMPs are used, then they must be sized to provide sufficient capacity for effective treatment of the remainder of the volume-based performance criteria that cannot be achieved with LID BMPs (TGD for WQMP Section 5.4.4.2). **Under no circumstances shall any portion of the DCV be released from the site without effective mitigation and/or treatment**.

Form 4.3-1 Infiltration BMP Feasibility (DA 1)
Feasibility Criterion – Complete evaluation for each DA on the Project Site
1 Would infiltration BMP pose significant risk for groundwater related concerns? Yes ☐ No ☒ *Refer to Section 5.3.2.1 of the TGD for WQMP*
If Yes, Provide basis: (attach)
2 Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes ☐ No ☒ (Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert): • The location is less than 50 feet away from slopes steeper than 15 percent • The location is less than eight feet from building foundations or an alternative setback. • A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.
If Yes, Provide basis: (attach)
3 Would infiltration of runoff on a Project site violate downstream water rights? Yes ☐ No ☒
If Yes, Provide basis: (attach)
4 Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils? Yes ☐ No ☒
If Yes, Provide basis: (attach)
5 Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? Yes ☐ No ☒
If Yes, Provide basis: (attach)
6 Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes ☐ No ☒ *See Section 3.5 of the TGD for WQMP and WAP*
If Yes, Provide basis: (attach)
7 Any answer from Item 1 through Item 3 is "Yes": Yes ☐ No ☒ *If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Harvest and Use BMP. If no, then proceed to Item 8 below.* 8 Any answer from Item 4 through Item 6 is "Yes": Yes ☐ No ☒ *If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Hydrologic Source Control BMP.* *If no, then proceed to Item 9, below.* 9 All answers to Item 1 through Item 6 are "No": *Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.* *Proceed to Form 4.3-2, Hydrologic Source Control BMP.*

4.3.1 Site Design Hydrologic Source Control BMP

Section XI.E. of the Permit emphasizes the use of LID preventative measures; and the use of LID HSC BMPs reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable HSC shall be provided except where they are mutually exclusive with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of HSC, if a project cannot feasibly meet BMP sizing requirements or cannot fully address HCOCs, feasibility of all applicable HSC must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design HSC BMP. Refer to Section 5.4.1 in the TGD for more detailed guidance.

Form 4.3-2 Site Design Hydrologic Source Control BMPs (DA 1)			
1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☒ No ☐ *If yes, complete Items 2-5; If no, proceed to Item 6*	DA 1 DMA A BMP Type Infiltration Basin	DA 1 DMA B BMP Type Infiltration Basin	DA DMA BMP Type
2 Total impervious area draining to pervious area (ft²)	131,270	100,800	
3 Ratio of pervious area receiving runoff to impervious area	0.83	0.84	
4 Retention volume achieved from impervious area dispersion (ft³) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff*	4,540	3,530	
5 Sum of retention volume achieved from impervious area dispersion (ft³): 8,070 *$V_{retention}$ =Sum of Item 4 for all BMPs*			
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☐ No ☒ *If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
7 Ponding surface area (ft²)			
8 Ponding depth (ft)			
9 Surface area of amended soil/gravel (ft²)			
10 Average depth of amended soil/gravel (ft)			
11 Average porosity of amended soil/gravel			
12 Retention volume achieved from on-lot infiltration (ft³) *$V_{retention}$ = (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)*			
13 Runoff volume retention from on-lot infiltration (ft³): 0 *$V_{retention}$ =Sum of Item 12 for all BMPs*			

Form 4.3-2 cont. Site Design Hydrologic Source Control BMPs (DA 1)

14 Implementation of evapotranspiration BMP (green, brown, or blue roofs): Yes ☐ No ☒ *If yes, complete Items 15-20. If no, proceed to Item 21*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
15 Rooftop area planned for ET BMP (ft^2)			
16 Average wet season ET demand (in/day) *Use local values, typical ~ 0.1*			
17 Daily ET demand (ft^3/day) *Item 15 * (Item 16 / 12)*			
18 Drawdown time (hrs) *Copy Item 6 in Form 4.2-1*			
19 Retention Volume (ft^3) *$V_{retention}$ = Item 17 * (Item 18 / 24)*			
20 Runoff volume retention from evapotranspiration BMPs (ft^3): *$V_{retention}$ =Sum of Item 19 for all BMPs*			
21 Implementation of Street Trees: Yes ☐ No ☒ *If yes, complete Items 22-25. If no, proceed to Item 26*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
22 Number of Street Trees			
23 Average canopy cover over impervious area (ft^2)			
24 Runoff volume retention from street trees (ft^3) *$V_{retention}$ = Item 22 * Item 23 * (0.05/12) assume runoff retention of 0.05 inches*			
25 Runoff volume retention from street tree BMPs (ft^3): *$V_{retention}$ = Sum of Item 24 for all BMPs*			
26 Implementation of residential rain barrel/cisterns: Yes ☐ No ☒ *If yes, complete Items 27-29; If no, proceed to Item 30*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
27 Number of rain barrels/cisterns			
28 Runoff volume retention from rain barrels/cisterns (ft^3) *$V_{retention}$ = Item 27 * 3*			
29 Runoff volume retention from residential rain barrels/Cisterns (ft3): *$V_{retention}$ =Sum of Item 28 for all BMPs*			
30 Total Retention Volume from Site Design Hydrologic Source Control BMPs: 0 *Sum of Items 5, 13, 20, 25 and 29*			

4.3.2 Infiltration BMPs

Use Form 4.3-3 to compute on-site retention of runoff from proposed retention and infiltration BMPs. Volume retention estimates are sensitive to the percolation rate used, which determines the amount of runoff that can be infiltrated within the specified drawdown time. The infiltration safety factor reduces field measured percolation to account for potential inaccuracy associated with field measurements, declining BMP performance over time, and compaction during construction. Appendix D of the TGD for WQMP provides guidance on estimating an appropriate safety factor to use in Form 4.3-3.

If site constraints limit the use of BMPs to a single type and implementation of retention and infiltration BMPs mitigate no more than 40% of the DCV, then they are considered infeasible and the Project Proponent may evaluate the effectiveness of BMPs lower in the LID hierarchy of use (Section 5.5.1 of the TGD for WQMP)

If implementation of infiltrations BMPs is feasible as determined using Form 4.3-1, then LID infiltration BMPs shall be implemented to the MEP (section 4.1 of the TGD for WQMP).

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Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)

[1] Remaining LID DCV not met by site design HSC BMP (ft^3): 24,480 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30*

BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA 1 DMA A BMP Type Infiltration Basin	DA 1 DMA B BMP Type Infiltration Basin	DA DMA BMP Type Infiltration Basin
[2] Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*	25.1	25.1	
[3] Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	2.2	2.2	
[4] Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	11.41	11.41	
[5] Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48	48	
[6] Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	1.5	1.5	
[7] Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	1.42	1.42	
[8] Infiltrating surface area, SA_{BMP} (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	9,260	3,350	
[9] Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	N/A	N/A	
[10] Amended soil porosity	N/A	N/A	
[11] Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	N/A	N/A	
[12] Gravel porosity	40%	40%	
[13] Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3	3	
[14] Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	41550	14313	
[15] Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	N/A	N/A	

[16] Total Retention Volume from LID Infiltration BMPs: 55,863 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*

[17] Fraction of DCV achieved with infiltration BMP: 230% *Retention% = Item 16 / Form 4.2-1 Item 7*

[18] Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☒ No ☐

If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.

4.3.3 Harvest and Use BMP

Harvest and use BMP may be considered if the full LID DCV cannot be met by maximizing infiltration BMPs. Use Form 4.3-4 to compute on-site retention of runoff from proposed harvest and use BMPs.

Volume retention estimates for harvest and use BMPs are sensitive to the on-site demand for captured stormwater. Since irrigation water demand is low in the wet season, when most rainfall events occur in San Bernardino County, the volume of water that can be used within a specified drawdown period is relatively low. The bottom portion of Form 4.3-4 facilitates the necessary computations to show infeasibility if a minimum incremental benefit of 40 percent of the LID DCV would not be achievable with MEP implementation of on-site harvest and use of stormwater (Section 5.5.4 of the TGD for WQMP).

Form 4.3-4 Harvest and Use BMPs (DA 1)			
1 Remaining LID DCV not met by site design HSC or infiltration BMP (ft^3): *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16*			
BMP Type(s) *Compute runoff volume retention from proposed harvest and use BMP (Select BMPs from Table 5-4 of the TGD for WQMP) - Use additional forms for more BMPs*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Describe cistern or runoff detention facility			
3 Storage volume for proposed detention type (ft^3) *Volume of cistern*			
4 Landscaped area planned for use of harvested stormwater (ft^2)			
5 Average wet season daily irrigation demand (in/day) Use local values, typical ~ 0.1 in/day			
6 Daily water demand (ft^3/day) *Item 4 * (Item 5 / 12)*			
7 Drawdown time (hrs) *Copy Item 6 from Form 4.2-1*			
8 Retention Volume (ft^3) *$V_{retention}$ = Minimum of (Item 3) or (Item 6 * (Item 7 / 24))*			
9 Total Retention Volume (ft^3) from Harvest and Use BMP *Sum of Item 8 for all harvest and use BMP included in plan*			
10 Is the full DCV retained with a combination of LID HSC, retention and infiltration, and harvest & use BMPs? Yes ☒ No ☐ *If yes, demonstrate conformance using Form 4.3-10. If no, then re-evaluate combinations of all LID BMP and optimize their implementation such that the maximum portion of the DCV is retained on-site (using a single BMP type or combination of BMP types). If the full DCV cannot be mitigated after this optimization process, proceed to Section 4.3.4.*			

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration, and harvest and use BMPs. A key consideration when using biotreatment BMP is the effectiveness of the proposed BMP in addressing the pollutants of concern for the project (see Table 5-5 of the TGD for WQMP).

Use Form 4.3-5 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV w. Biotreatment computations are included as follows:

- Use Form 4.3-6 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-7 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-8 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-5 Selection and Evaluation of Biotreatment BMP (DA 1)		
1 Remaining LID DCV not met by site design HSC, infiltration, or harvest and use BMP for potential biotreatment (ft^3): 0 *Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16- Form 4.3-4 Item 9*	List pollutants of concern *Copy from Form 2.3-1.* Pathogens (Bacteria/Virus), Phosphorous, Nitrogen, Sediment, Metals, Oil and Grease, Trash/Debris, Pesticides/Herbicides, Organic Compounds	
2 Biotreatment BMP Selected *(Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)*	Volume-based biotreatment *Use Forms 4.3-6 and 4.3-7 to compute treated volume* ☐ Bioretention with underdrain ☐ Planter box with underdrain ☐ Constructed wetlands ☐ Wet extended detention ☐ Dry extended detention	Flow-based biotreatment *Use Form 4.3-8 to compute treated volume* ☐ Vegetated swale ☐ Vegetated filter strip ☐ Proprietary biotreatment
3 Volume biotreated in volume based biotreatment BMP (ft^3): 0 *Form 4.3-6 Item 15 + Form 4.3-7 Item 13*	4 Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft^3): 0 *Item 1 – Item 3*	5 Remaining fraction of LID DCV for sizing flow based biotreatment BMP: 0%% *Item 4 / Item 1*
6 Flow-based biotreatment BMP capacity provided (cfs): N/A *Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)*		
7 Metrics for MEP determination: • Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development: ☐ *If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.*		

Form 4.3-6 Volume Based Biotreatment (DA 1) – Bioretention and Planter Boxes with Underdrains			
Biotreatment BMP Type *(Bioretention w/underdrain, planter box w/underdrain, other comparable BMP)*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*			
2 Amended soil infiltration rate *Typical ~ 5.0*			
3 Amended soil infiltration safety factor *Typical ~ 2.0*			
4 Amended soil design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*			
5 Ponded water drawdown time (hr) *Copy Item 6 from Form 4.2-1*			
6 Maximum ponding depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12 * Item 4 * Item 5) or Item 6*			
8 Amended soil surface area (ft^2)			
9 Amended soil depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
10 Amended soil porosity, *n*			
11 Gravel depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
12 Gravel porosity, *n*			
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*			
14 Biotreated Volume (ft^3) *$V_{biotreated}$ = Item 8 * [(Item 7/2) + (Item 9 * Item 10) +(Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*			
15 Total biotreated volume from bioretention and/or planter box with underdrains BMP: *Sum of Item 14 for all volume-based BMPs included in this form*			

Form 4.3-7 Volume Based Biotreatment (DA 1) – Constructed Wetlands and Extended Detention				
Biotreatment BMP Type *Constructed wetlands, extended wet detention, extended dry detention, or other comparable proprietary BMP. If BMP includes multiple modules (e.g. forebay and main basin), provide separate estimates for storage and pollutants treated in each module.*	DA DMA BMP Type		DA DMA BMP Type *(Use additional forms for more BMPs)*	
	Forebay	Basin	Forebay	Basin
1 Pollutants addressed with BMP forebay and basin *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*				
2 Bottom width (ft)				
3 Bottom length (ft)				
4 Bottom area (ft^2) A_{bottom} = *Item 2 * Item 3*				
5 Side slope (ft/ft)				
6 Depth of storage (ft)				
7 Water surface area (ft^2) $A_{surface}$ =*(Item 2 + (2 * Item 5 * Item 6)) * (Item 3 + (2 * Item 5 * Item 6))*				
8 Storage volume (ft^3) *For BMP with a forebay, ensure fraction of total storage is within ranges specified in BMP specific fact sheets, see Table 5-6 of the TGD for WQMP for reference to BMP design details* V =*Item 6 / 3 * [Item 4 + Item 7 + (Item 4 * Item 7)^0.5]*				
9 Drawdown Time (hrs) *Copy Item 6 from Form 2.1*				
10 Outflow rate (cfs) Q_{BMP} = *(Item* $8_{forebay}$ *+ Item* 8_{basin}*) / (Item 9 * 3600)*				
11 Duration of design storm event (hrs)				
12 Biotreated Volume (ft^3) $V_{biotreated}$ = *(Item* $8_{forebay}$ *+ Item* 8_{basin}*) +(Item 10 * Item 11 * 3600)*				
13 Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention : 0 *(Sum of Item 12 for all BMP included in plan)*				

Form 4.3-8 Flow Based Biotreatment (DA 1)			
Biotreatment BMP Type *Vegetated swale, vegetated filter strip, or other comparable proprietary BMP*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in TGD Table 5-5*			
2 Flow depth for water quality treatment (ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
3 Bed slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
4 Manning's roughness coefficient			
5 Bottom width (ft) *b_w = (Form 4.3-5 Item 6 * Item 4) / (1.49 * Item $2^{\wedge 1.67}$ * Item $3^{\wedge 0.5}$)*			
6 Side Slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
7 Cross sectional area (ft^2) *A = (Item 5 * Item 2) + (Item 6 * Item $2^{\wedge 2}$)*			
8 Water quality flow velocity (ft/sec) *V = Form 4.3-5 Item 6 / Item 7*			
9 Hydraulic residence time (min) *Pollutant specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
10 Length of flow based BMP (ft) *L = Item 8 * Item 9 * 60*			
11 Water surface area at water quality flow depth (ft^2) *SA_{top} = (Item 5 + (2 * Item 2 * Item 6)) * Item 10*			

4.3.5 Conformance Summary

Complete Form 4.3-9 to demonstrate how on-site LID DCV is met with proposed site design hydrologic source control, infiltration, harvest and use, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)

1 Total LID DCV for the Project DA-1 (ft^3): 24,480 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design hydrologic source control LID BMP (ft^3): 0 *Copy Item 30 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): 55,863 *Copy Item 16 in Form 4.3-3*

4 On-site retention with LID harvest and use BMP (ft^3): 0 *Copy Item 9 in Form 4.3-4*

5 On-site biotreatment with volume based biotreatment BMP (ft^3): 0 *Copy Item 3 in Form 4.3-5*

6 Flow capacity provided by flow based biotreatment BMP (cfs): N/A *Copy Item 6 in Form 4.3-5*

7 LID BMP performance criteria are achieved if answer to any of the following is “Yes”:

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP: Yes ☒ No ☐
  If yes, sum of Items 2, 3, and 4 is greater than Item 1
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☒ No ☐
  If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized
- On-site retention and infiltration is determined to be infeasible and biotreatment BMP provide biotreatment for all pollutants of concern for full LID DCV: Yes ☒ No ☐
  If yes, Form 4.3-1 Items 7 and 8 were both checked yes

8 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐
  Checked yes for Form 4.3-5 Item 7, Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} *= (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

4.3.6 Hydromodification Control BMP

Use Form 4.3-10 to compute the remaining runoff volume retention, after LID BMP are implemented, needed to address HCOC, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential HCOC. Describe hydromodification control BMP that address HCOC, which may include off-site BMP and/or in-stream controls. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-10 Hydromodification Control BMPs (DA 1)

1 Volume reduction needed for HCOC performance criteria (ft^3): 0 *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	2 On-site retention with site design hydrologic source control, infiltration, and harvest and use LID BMP (ft^3): *Sum of Form 4.3-9 Items 2, 3, and 4 Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving HCOC volume reduction*
3 Remaining volume for HCOC volume capture (ft^3): *Item 1 – Item 2*	4 Volume capture provided by incorporating additional on-site or off-site retention BMPs (ft^3): *Existing downstream BMP may be used to demonstrate additional volume capture (if so, attach to this WQMP a hydrologic analysis showing how the additional volume would be retained during a 2-yr storm event for the regional watershed)*

5 If Item 4 is less than Item 3, incorporate in-stream controls on downstream waterbody segment to prevent impacts due to hydromodification ☐ *Attach in-stream control BMP selection and evaluation to this WQMP*

6 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☐

If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site or off-site retention BMP ☐
  BMP upstream of a waterbody segment with a potential HCOC may be used to demonstrate increased time of concentration through hydrograph attenuation (if so, show that the hydraulic residence time provided in BMP for a 2-year storm event is equal or greater than the addition time of concentration requirement in Form 4.2-4 Item 15)
- Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

7 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☐

If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site or off-site retention BMPs ☐
  BMPs upstream of a waterbody segment with a potential HCOC may be used to demonstrate additional peak runoff reduction through hydrograph attenuation (if so, attach to this WQMP, a hydrograph analysis showing how the peak runoff would be reduced during a 2-yr storm event)
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, harvest and use, or biotreat the DCV via on-site LID practices. A project proponent must develop an alternative compliance plan to address the remainder of the LID DCV. Depending on project type some projects may qualify for water quality credits that can be applied to reduce the DCV that must be treated prior to development of an alternative compliance plan (see Form 2.4-1, Water Quality Credits). Form 4.3-9 Item 8 includes instructions on how to apply water quality credits when computing the DCV that must be met through alternative compliance. Alternative compliance plans may include one or more of the following elements:

- On-site structural treatment control BMP - All treatment control BMP should be located as close to possible to the pollutant sources and should not be located within receiving waters;
- Off-site structural treatment control BMP - Pollutant removal should occur prior to discharge of runoff to receiving waters;
- Urban runoff fund or In-lieu program, if available

Depending upon the proposed alternative compliance plan, approval by the executive officer may or may not be required (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMP included as part of the project WQMP are required to be maintained through regular scheduled inspection and maintenance (refer to Section 8, Post Construction BMP Requirements, in the TGD for WQMP). Fully complete Form 5-1 summarizing all BMP included in the WQMP. Attach additional forms as needed. The WQMP shall also include a detailed Operation and Maintenance Plan for all BMP and may require a Maintenance Agreement (consult the jurisdiction's LIP). If a Maintenance Agreement is required, it must also be attached to the WQMP.

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
Infiltration Basins	Property Owners	Inspection, Cleaning	Quarterly
Education of Property Owners	Property Owners	Provide educational material (see copies herein)	Quarterly
Landscaping	Property Owners	Standard landscaping maintenance activities, including trash removal, proper replacement of landscaping as needed, and regular triming	Monthly
Efficient Irrigation	Property Owners	Standard maintenance activities (ensure no over-watering, minimize watering on hardscape	Monthly
Litter control and street weeping	Property Owners	Standard landscaping maintenance	Weekly
Trash Storage areas	Property Owners	Standard landscaping maintenance	Weekly
Drainage Facility Inspection and Maintenance	Property Owners	Standard landscaping maintenance	Quarterly

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural Source Control BMP locations
- Site Design Hydrologic Source Control BMP locations
- LID BMP details
- Drainage delineations and flow information
- Drainage connections

6.2 Electronic Data Submittal

Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their local Local Implementation Plan), this section will describe the contents (e.g., layering, nomenclature, geo-referencing, etc.) of these documents so that they may be interpreted efficiently and accurately.

6.3 Post Construction

Attach all O&M Plans and Maintenance Agreements for BMP to the WQMP.

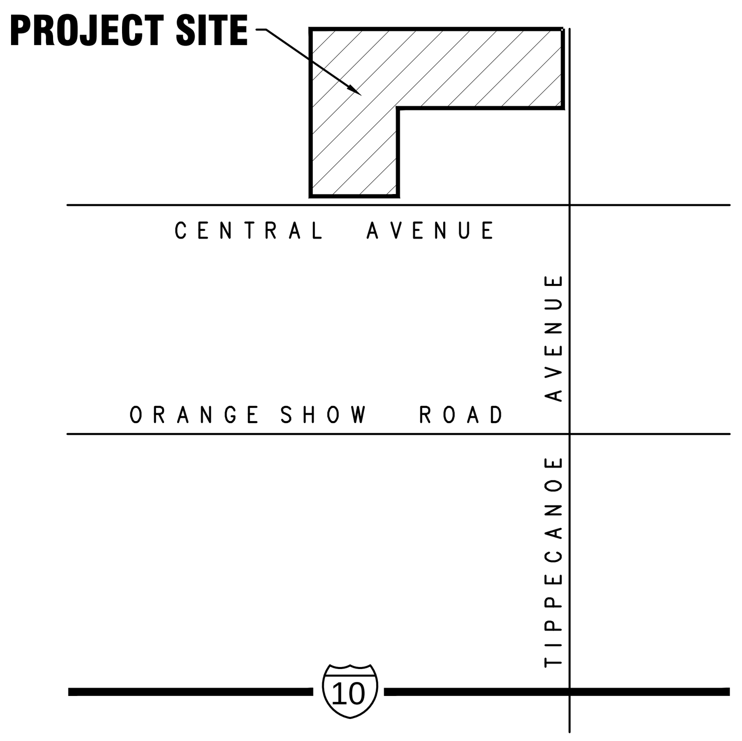
6.4 Other Supporting Documentation

- San Bernardino County Stormwater Facilities Map Tool – Site Map
- BMP Educational Materials
- Activity Restriction – C, C&R's & Lease Agreements

Attachment A

WQMP Site Plan

WQMP SITE PLAN



VICINITY MAP

LEGEND

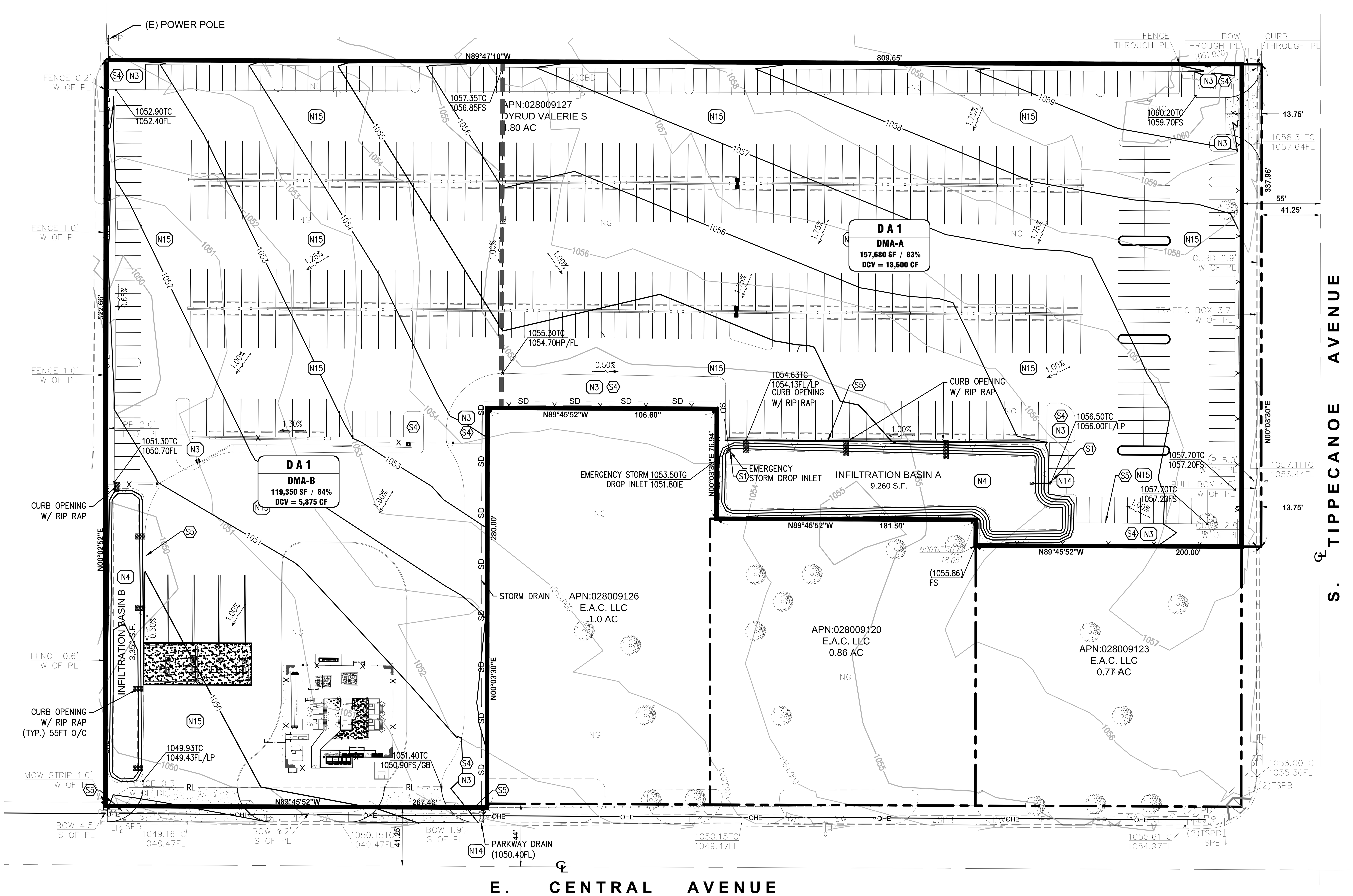
DA 1 / DMA-A / 5,000 SF / 90% / DCV = 5,500 CF	DRAINAGE AREA (DA1)
	DRAINAGE MANAGEMENT AREA (DMA)
	DMA AREA (SF) / DMA PERCENT IMPERVIOUS
	DESIGN CAPTURE VOLUME (Vbmp)
	TREE TO REMAIN
1.00%	DRAINAGE PATH DIRECTION AND GRADE SLOPE

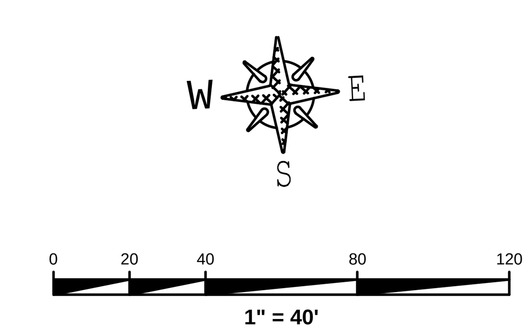
NON-STRUCTURAL SOURCE CONTROL BMP

N1	EDUCATION
N2	ACTIVITY RESTRICTIONS
N3	LANDSCAPE MANAGEMENT
N4	BMP MAINTENANCE
N5	BMP MAINTENANCE
N6	LOCAL WATER QUALITY ORGINDANCIES
N7	SPILL CONTINGENCY PLAN
N8	UNDERGROUND STORAGE TANK COMPLIANCE
N9	HAZARDOUS MATERIAL DISCLOSURE COMPLIANCE
N10	UNIFORM FIRE CODE IMPLEMENTATION
N11	LITTER/DEBRIS CONTROL PROGRAM
N12	EMPLOYEE PARKING
N14	CATCH BASIN INSPECTION PROGRAM
N15	VACUUM SWEEPING OF PARKING LOT
N17	COMPLIANCE WITH ALL OTHER APPLICABLE NPDES STANDARDS

STRUCTURAL SOURCE CONTROL BMP

S1	PROVIDE STORM DRAIN SYSTEM STENCELING AND SIGNAGE
S2	USE EFFICIENT IRRIGATION SYSTEMS & LANDSCAPE DESIGN, WATER CONSERVATION, SMART CONTROLLERS, AND SOURCE CONTROL
S4	EFFICIENT IRRIGATION, SD-12
S5	FG OF LANDSCAPE AREAS A MINIMUM OF 1" TO 2" BELOW TC, SIDEWALK, OR PAVEMENT





DIGALERT
Know what's below. CALL 811 before you dig.

REDUCED PLAN
CAUTION: THIS DRAWING MAY BE REDUCED

REV	DATE	REVISIONS	BY
0	08/27/2021	ISSUED FOR REVIEW	PB

Clean Energy

CNG FUELING STATION
SAN BERNARDINO CNG FUELING STATION
E. CENTRAL AVE
SAN BERNARDINO, CA
PRELIMINARY GRADING PLAN
ASSET NO:21061

DATE 09/23/2021	DRAWN BY:	PB
	CHECKED BY:	ML
SCALE AS NOTED		
SHEET WQMP - 1		

Attachment B

BMP Factsheets/Educational Material

Photo Credit: Geoff Brosseau

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Description

Many activities that occur at an industrial or commercial site have the potential to cause accidental or illegal spills. Preparation for accidental or illegal spills, with proper training and reporting systems implemented, can minimize the discharge of pollutants to the environment.

Spills and leaks are one of the largest contributors of stormwater pollutants. Spill prevention and control plans are applicable to any site at which hazardous materials are stored or used. An effective plan should have spill prevention and response procedures that identify potential spill areas, specify material handling procedures, describe spill response procedures, and provide spill clean-up equipment. The plan should take steps to identify and characterize potential spills, eliminate and reduce spill potential, respond to spills when they occur in an effort to prevent pollutants from entering the stormwater drainage system, and train personnel to prevent and control future spills.

Approach

Pollution Prevention

- Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.

- Develop a Spill Prevention Control and Countermeasure (SPCC) Plan. The plan should include:

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- Description of the facility, owner and address, activities and chemicals present
- Facility map
- Notification and evacuation procedures
- Cleanup instructions
- Identification of responsible departments
- Identify key spill response personnel

■ Recycle, reclaim, or reuse materials whenever possible. This will reduce the amount of process materials that are brought into the facility.

Suggested Protocols (including equipment needs)
Spill Prevention

■ Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.

■ If consistent illegal dumping is observed at the facility:

- Post “No Dumping” signs with a phone number for reporting illegal dumping and disposal. Signs should also indicate fines and penalties applicable for illegal dumping.
- Landscaping and beautification efforts may also discourage illegal dumping.
- Bright lighting and/or entrance barriers may also be needed to discourage illegal dumping.

■ Store and contain liquid materials in such a manner that if the tank is ruptured, the contents will not discharge, flow, or be washed into the storm drainage system, surface waters, or groundwater.

■ If the liquid is oil, gas, or other material that separates from and floats on water, install a spill control device (such as a tee section) in the catch basins that collects runoff from the storage tank area.

■ Routine maintenance:

- Place drip pans or absorbent materials beneath all mounted taps, and at all potential drip and spill locations during filling and unloading of tanks. Any collected liquids or soiled absorbent materials must be reused/recycled or properly disposed.
- Store and maintain appropriate spill cleanup materials in a location known to all near the tank storage area; and ensure that employees are familiar with the site’s spill control plan and/or proper spill cleanup procedures.
- Sweep and clean the storage area monthly if it is paved, *do not hose down the area to a storm drain.*

- Check tanks (and any containment sumps) daily for leaks and spills. Replace tanks that are leaking, corroded, or otherwise deteriorating with tanks in good condition. Collect all spilled liquids and properly dispose of them.

- Label all containers according to their contents (e.g., solvent, gasoline).

- Label hazardous substances regarding the potential hazard (corrosive, radioactive, flammable, explosive, poisonous).

- Prominently display required labels on transported hazardous and toxic materials (per US DOT regulations).

- Identify key spill response personnel.

Spill Control and Cleanup Activities

- Follow the Spill Prevention Control and Countermeasure Plan.

- Clean up leaks and spills immediately.

- Place a stockpile of spill cleanup materials where it will be readily accessible (e.g., near storage and maintenance areas).

- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste. Physical methods for the cleanup of dry chemicals include the use of brooms, shovels, sweepers, or plows.

- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.

- Chemical cleanups of material can be achieved with the use of adsorbents, gels, and foams. Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.

- For larger spills, a private spill cleanup company or Hazmat team may be necessary.

Reporting

- Report spills that pose an immediate threat to human health or the environment to the Regional Water Quality Control Board.

- Federal regulations require that any oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour).

- Report spills to local agencies, such as the fire department; they can assist in cleanup.

- Establish a system for tracking incidents. The system should be designed to identify the following:

  - Types and quantities (in some cases) of wastes

  - Patterns in time of occurrence (time of day/night, month, or year)

- Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)

- Responsible parties

Training

- Educate employees about spill prevention and cleanup.

- Well-trained employees can reduce human errors that lead to accidental releases or spills:

  - The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.

  - Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.

- Employees should be educated about aboveground storage tank requirements. Employees responsible for aboveground storage tanks and liquid transfers should be thoroughly familiar with the Spill Prevention Control and Countermeasure Plan and the plan should be readily available.

- Train employees to recognize and report illegal dumping incidents.

Other Considerations (Limitations and Regulations)

- A Spill Prevention Control and Countermeasure Plan (SPCC) is required for facilities that are subject to the oil pollution regulations specified in Part 112 of Title 40 of the Code of Federal Regulations or if they have a storage capacity of 10,000 gallons or more of petroleum. (Health and Safety Code 6.67)

- State regulations also exist for storage of hazardous materials (Health & Safety Code Chapter 6.95), including the preparation of area and business plans for emergency response to the releases or threatened releases.

- Consider requiring smaller secondary containment areas (less than 200 sq. ft.) to be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.

Requirements

Costs (including capital and operation & maintenance)

- Will vary depending on the size of the facility and the necessary controls.

- Prevention of leaks and spills is inexpensive. Treatment and/or disposal of contaminated soil or water can be quite expensive.

Maintenance (including administrative and staffing)

- This BMP has no major administrative or staffing requirements. However, extra time is needed to properly handle and dispose of spills, which results in increased labor costs.

Supplemental Information

Further Detail of the BMP

Reporting

Record keeping and internal reporting represent good operating practices because they can increase the efficiency of the facility and the effectiveness of BMPs. A good record keeping system helps the facility minimize incident recurrence, correctly respond with appropriate cleanup activities, and comply with legal requirements. A record keeping and reporting system should be set up for documenting spills, leaks, and other discharges, including discharges of hazardous substances in reportable quantities. Incident records describe the quality and quantity of non-stormwater discharges to the storm sewer. These records should contain the following information:

- Date and time of the incident
- Weather conditions
- Duration of the spill/leak/discharge
- Cause of the spill/leak/discharge
- Response procedures implemented
- Persons notified
- Environmental problems associated with the spill/leak/discharge

Separate record keeping systems should be established to document housekeeping and preventive maintenance inspections, and training activities. All housekeeping and preventive maintenance inspections should be documented. Inspection documentation should contain the following information:

- The date and time the inspection was performed
- Name of the inspector
- Items inspected
- Problems noted
- Corrective action required
- Date corrective action was taken

Other means to document and record inspection results are field notes, timed and dated photographs, videotapes, and drawings and maps.

Aboveground Tank Leak and Spill Control

Accidental releases of materials from aboveground liquid storage tanks present the potential for contaminating stormwater with many different pollutants. Materials spilled, leaked, or lost from tanks may accumulate in soils or on impervious surfaces and be carried away by stormwater runoff.

The most common causes of unintentional releases are:

- Installation problems
- Failure of piping systems (pipes, pumps, flanges, couplings, hoses, and valves)
- External corrosion and structural failure
- Spills and overfills due to operator error
- Leaks during pumping of liquids or gases from truck or rail car to a storage tank or vice versa

Storage of reactive, ignitable, or flammable liquids should comply with the Uniform Fire Code and the National Electric Code. Practices listed below should be employed to enhance the code requirements:

- Tanks should be placed in a designated area.
- Tanks located in areas where firearms are discharged should be encapsulated in concrete or the equivalent.
- Designated areas should be impervious and paved with Portland cement concrete, free of cracks and gaps, in order to contain leaks and spills.
- Liquid materials should be stored in UL approved double walled tanks or surrounded by a curb or dike to provide the volume to contain 10 percent of the volume of all of the containers or 110 percent of the volume of the largest container, whichever is greater. The area inside the curb should slope to a drain.
- For used oil or dangerous waste, a dead-end sump should be installed in the drain.
- All other liquids should be drained to the sanitary sewer if available. The drain must have a positive control such as a lock, valve, or plug to prevent release of contaminated liquids.
- Accumulated stormwater in petroleum storage areas should be passed through an oil/water separator.

Maintenance is critical to preventing leaks and spills. Conduct routine inspections and:

- Check for external corrosion and structural failure.
- Check for spills and overfills due to operator error.
- Check for failure of piping system (pipes, pumps, flanger, coupling, hoses, and valves).
- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.

- Visually inspect new tank or container installation for loose fittings, poor welding, and improper or poorly fitted gaskets.

- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.

- Frequently relocate accumulated stormwater during the wet season.

- Periodically conduct integrity testing by a qualified professional.

Vehicle Leak and Spill Control

Major spills on roadways and other public areas are generally handled by highly trained Hazmat teams from local fire departments or environmental health departments. The measures listed below pertain to leaks and smaller spills at vehicle maintenance shops.

In addition to implementing the spill prevention, control, and clean up practices above, use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- Perform all vehicle fluid removal or changing inside or under cover to prevent the run-on of stormwater and the runoff of spills.

- Regularly inspect vehicles and equipment for leaks, and repair immediately.

- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.

- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.

- Immediately drain all fluids from wrecked vehicles.

- Store wrecked vehicles or damaged equipment under cover.

- Place drip pans or absorbent materials under heavy equipment when not in use.

- Use adsorbent materials on small spills rather than hosing down the spill.

- Remove the adsorbent materials promptly and dispose of properly.

- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.

- Oil filters disposed of in trashcans or dumpsters can leak oil and contaminate stormwater. Place the oil filter in a funnel over a waste oil recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.

- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- Design the fueling area to prevent the run-on of stormwater and the runoff of spills:
  - Cover fueling area if possible.
  - Use a perimeter drain or slope pavement inward with drainage to a sump.
  - Pave fueling area with concrete rather than asphalt.
- If dead-end sump is not used to collect spills, install an oil/water separator.
- Install vapor recovery nozzles to help control drips as well as air pollution.
- Discourage "topping-off' of fuel tanks.
- Use secondary containment when transferring fuel from the tank truck to the fuel tank.
- Use adsorbent materials on small spills and general cleaning rather than hosing down the area. Remove the adsorbent materials promptly.
- Carry out all Federal and State requirements regarding underground storage tanks, or install above ground tanks.
- Do not use mobile fueling of mobile industrial equipment around the facility; rather, transport the equipment to designated fueling areas.
- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Train employees in proper fueling and cleanup procedures.

Industrial Spill Prevention Response

For the purposes of developing a spill prevention and response program to meet the stormwater regulations, facility managers should use information provided in this fact sheet and the spill prevention/response portions of the fact sheets in this handbook, for specific activities. The program should:

- Integrate with existing emergency response/hazardous materials programs (e.g., Fire Department)
- Develop procedures to prevent/mitigate spills to storm drain systems
- Identify responsible departments
- Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures
- Address spills at municipal facilities, as well as public areas

- Provide training concerning spill prevention, response and cleanup to all appropriate personnel

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Stormwater Managers Resource Center http://www.stormwatercenter.net/

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description

Improper storage and handling of solid wastes can allow toxic compounds, oils and greases, heavy metals, nutrients, suspended solids, and other pollutants to enter stormwater runoff. The discharge of pollutants to stormwater from waste handling and disposal can be prevented and reduced by tracking waste generation, storage, and disposal; reducing waste generation and disposal through source reduction, reuse, and recycling; and preventing run-on and runoff.

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

Approach

Pollution Prevention

- Accomplish reduction in the amount of waste generated using the following source controls:
  - Production planning and sequencing
  - Process or equipment modification
  - Raw material substitution or elimination
  - Loss prevention and housekeeping
  - Waste segregation and separation
  - Close loop recycling
- Establish a material tracking system to increase awareness about material usage. This may reduce spills and minimize contamination, thus reducing the amount of waste produced.
- Recycle materials whenever possible.

Suggested Protocols

General

- Cover storage containers with leak proof lids or some other means. If waste is not in containers, cover all waste piles (plastic tarps are acceptable coverage) and prevent stormwater run-on and runoff with a berm. The waste containers or piles must be covered except when in use.
- Use drip pans or absorbent materials whenever grease containers are emptied by vacuum trucks or other means. Grease cannot be left on the ground. Collected grease must be properly disposed of as garbage.
- Check storage containers weekly for leaks and to ensure that lids are on tightly. Replace any that are leaking, corroded, or otherwise deteriorating.
- Sweep and clean the storage area regularly. If it is paved, do not hose down the area to a storm drain.
- Dispose of rinse and wash water from cleaning waste containers into a sanitary sewer if allowed by the local sewer authority. Do not discharge wash water to the street or storm drain.
- Transfer waste from damaged containers into safe containers.
- Take special care when loading or unloading wastes to minimize losses. Loading systems can be used to minimize spills and fugitive emission losses such as dust or mist. Vacuum transfer systems can minimize waste loss.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide a sufficient number of litter receptacles for the facility.
- Clean out and cover litter receptacles frequently to prevent spillage.

Waste Collection

- Keep waste collection areas clean.
- Inspect solid waste containers for structural damage regularly. Repair or replace damaged containers as necessary.
- Secure solid waste containers; containers must be closed tightly when not in use.
- Do not fill waste containers with washout water or any other liquid.
- Ensure that only appropriate solid wastes are added to the solid waste container. Certain wastes such as hazardous wastes, appliances, fluorescent lamps, pesticides, etc., may not be disposed of in solid waste containers (see chemical/ hazardous waste collection section below).

- Do not mix wastes; this can cause chemical reactions, make recycling impossible, and complicate disposal.

Good Housekeeping
- Use all of the product before disposing of the container.

- Keep the waste management area clean at all times by sweeping and cleaning up spills immediately.

- Use dry methods when possible (e.g., sweeping, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.

Chemical/Hazardous Wastes
- Select designated hazardous waste collection areas on-site.

- Store hazardous materials and wastes in covered containers and protect them from vandalism.

- Place hazardous waste containers in secondary containment.

- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.

- Stencil or demarcate storm drains on the facility's property with prohibitive message regarding waste disposal.

Run-on/Runoff Prevention
- Prevent stormwater run-on from entering the waste management area by enclosing the area or building a berm around the area.

- Prevent waste materials from directly contacting rain.

- Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropyleneor hypalon.

- Cover the area with a permanent roof if feasible.

- Cover dumpsters to prevent rain from washing waste out of holes or cracks in the bottom of the dumpster.

- Move the activity indoor after ensuring all safety concerns such as fire hazard and ventilation are addressed.

Inspection
- Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.

- Check waste management areas for leaking containers or spills.

- Repair leaking equipment including valves, lines, seals, or pumps promptly.

Training

- Train staff in pollution prevention measures and proper disposal methods.
- Train employees and contractors in proper spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.
- Train employees and subcontractors in proper hazardous waste management.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Have an emergency plan, equipment and trained personnel ready at all times to deal immediately with major spills
- Collect all spilled liquids and properly dispose of them.
- Store and maintain appropriate spill cleanup materials in a location known to all near the designated wash area.
- Ensure that vehicles transporting waste have spill prevention equipment that can prevent spills during transport. Spill prevention equipment includes:
  - Vehicles equipped with baffles for liquid waste
  - Trucks with sealed gates and spill guards for solid waste

Other Considerations (Limitations and Regulations)

Hazardous waste cannot be reused or recycled; it must be disposed of by a licensed hazardous waste hauler.

Requirements

Costs

Capital and O&M costs for these programs will vary substantially depending on the size of the facility and the types of waste handled. Costs should be low if there is an inventory program in place.

Maintenance

- None except for maintaining equipment for material tracking program.

Supplemental Information

Further Detail of the BMP

Land Treatment System

Minimize runoff of polluted stormwater from land application by:

- Choosing a site where slopes are under 6%, the soil is permeable, there is a low water table, it is located away from wetlands or marshes, and there is a closed drainage system

- Avoiding application of waste to the site when it is raining or when the ground is saturated with water

- Growing vegetation on land disposal areas to stabilize soils and reduce the volume of surface water runoff from the site

- Maintaining adequate barriers between the land application site and the receiving waters (planted strips are particularly good)

- Using erosion control techniques such as mulching and matting, filter fences, straw bales, diversion terracing, and sediment basins

- Performing routine maintenance to ensure the erosion control or site stabilization measures are working

Examples
The port of Long Beach has a state-of-the-art database for identifying potential pollutant sources, documenting facility management practices, and tracking pollutants.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

Solid Waste Container Best Management Practices – Fact Sheet On-Line Resources – Environmental Health and Safety. Harvard University. 2002.

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Objectives

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Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

Description

Areas within an industrial site that are bare of vegetation or are subject to activities that promote the suppression of vegetation are often subject to erosion. In addition, they may or may not be contaminated from past or current activities. If the area is temporarily bare because of construction, see SC-42, Building Repair, Remodeling, and Construction. Sites with excessive erosion or the potential for excessive erosion should consider employing the soil erosion BMPs identified in the Construction BMP Handbook. Note that this fact sheet addresses soils that are not so contaminated as to exceed hazardous waste criteria (see Title 22 California Code of Regulations for Hazardous Waste Criteria).

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

Preserve natural vegetation whenever possible. See also EC-2, Preservation of Existing Vegetation, in the Construction BMP Handbook.

Suggested Protocols

- Preserve natural vegetation.
- Analyze soil conditions.
- Re-vegetate when necessary.
- Remove contaminated soil.
- Utilize chemical stabilization when needed. See also EC-5, Soil Binders, and EC-13, Polyacrylamide, in the Construction BMP Handbook.
- Use geosynthetic membranes to control erosion if feasible. See also EC-7, Geotextiles and Mats, in the Construction BMP Handbook.

Training

Training is not a significant element of this best management practice.

CASQA California Stormwater Quality Association

Building & Grounds Maintenance SC-41

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	
Organics	

CASQA
California Stormwater Quality Association

Description

Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, abnormal pH, and oils and greases. Utilizing the protocols in this fact sheet will prevent or reduce the discharge of pollutants to stormwater from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, keeping debris from entering the storm drains, and maintaining the stormwater collection system.

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Encourage proper lawn management and landscaping, including use of native vegetation.

- Encourage use of Integrated Pest Management techniques for pest control.
- Encourage proper onsite recycling of yard trimmings.
- Recycle residual paints, solvents, lumber, and other material as much as possible.

Suggested Protocols

Pressure Washing of Buildings, Rooftops, and Other Large Objects

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.
- If soaps or detergents are not used, and the surrounding area is paved, wash runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in the catch basin to trap the particles in wash water runoff.
- If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement.

Landscaping Activities

- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures on exposed soils.

Building Repair, Remodeling, and Construction

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.
- Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.
- Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.
- Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.
- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. This is particularly necessary on rainy days. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and solids must be collected and disposed of before removing the containment device(s) at the end of the work day.

- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. If directed off-site, you should direct the water through hay bales and filter fabric or use other sediment filters or traps.
- Store toxic material under cover during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

Mowing, Trimming, and Planting

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures when soils are exposed.
- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Consider an alternative approach when bailing out muddy water: do not put it in the storm drain; pour over landscaped areas.
- Use hand weeding where practical.

Fertilizer and Pesticide Management

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.
- Use less toxic pesticides that will do the job when applicable. Avoid use of copper-based pesticides if possible.
- Do not use pesticides if rain is expected.
- Do not mix or prepare pesticides for application near storm drains.
- Use the minimum amount needed for the job.
- Calibrate fertilizer distributors to avoid excessive application.
- Employ techniques to minimize off-target application (e.g., spray drift) of pesticides, including consideration of alternative application techniques.
- Apply pesticides only when wind speeds are low.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Irrigate slowly to prevent runoff and then only as much as is needed.
- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Dispose of empty pesticide containers according to the instructions on the container label.

- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering and repair leaks in the irrigation system as soon as they are observed.

Training

- Educate and train employees on pesticide use and in pesticide application techniques to prevent pollution.
- Train employees and contractors in proper techniques for spill containment and cleanup.
- Be sure the frequency of training takes into account the complexity of the operations and the nature of the staff.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials, such as brooms, dustpans, and vacuum sweepers (if desired) near the storage area where it will be readily accessible.
- Have employees trained in spill containment and cleanup present during the loading/unloading of dangerous wastes, liquid chemicals, or other materials.
- Familiarize employees with the Spill Prevention Control and Countermeasure Plan.
- Clean up spills immediately.

Other Considerations

Alternative pest/weed controls may not be available, suitable, or effective in many cases.

Requirements

Costs

- Cost will vary depending on the type and size of facility.
- Overall costs should be low in comparison to other BMPs.

Maintenance

Sweep paved areas regularly to collect loose particles. Wipe up spills with rags and other absorbent material immediately, do not hose down the area to a storm drain.

Supplemental Information

Further Detail of the BMP

Fire Sprinkler Line Flushing

Building fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water, though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping, but it is subject to rusting and results in lower quality water. Initially, the black iron pipe has an oil coating to protect it from rusting between manufacture and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, poly-phosphates and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time (typically a year) and between flushes may accumulate iron, manganese, lead, copper, nickel, and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in fire sprinkler line water.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Mobile Cleaners Pilot Program: Final Report. 1997. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Parking/Storage Area Maintenance SC-43

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Description

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through stormwater runoff or non-stormwater discharges. The protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants from parking/storage areas and include using good housekeeping practices, following appropriate cleaning BMPs, and training employees.

Approach

The goal of this program is to ensure stormwater pollution prevention practices are considered when conducting activities on or around parking areas and storage areas to reduce potential for pollutant discharge to receiving waters. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Encourage alternative designs and maintenance strategies for impervious parking lots. (See New Development and Redevelopment BMP Handbook)

- Keep accurate maintenance logs to evaluate BMP implementation.

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Suggested Protocols

General

- Keep the parking and storage areas clean and orderly. Remove debris in a timely fashion.
- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low quantities.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Discharge soapy water remaining in mop or wash buckets to the sanitary sewer through a sink, toilet, clean-out, or wash area with drain.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide an adequate number of litter receptacles.
- Clean out and cover litter receptacles frequently to prevent spillage.
- Provide trash receptacles in parking lots to discourage litter.
- Routinely sweep, shovel, and dispose of litter in the trash.

Surface Cleaning

- Use dry cleaning methods (e.g., sweeping, vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system if possible.
- Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- Sweep all parking lots at least once before the onset of the wet season.
- Follow the procedures below if water is used to clean surfaces:
  - Block the storm drain or contain runoff.
  - Collect and pump wash water to the sanitary sewer or discharge to a pervious surface. Do not allow wash water to enter storm drains.
  - Dispose of parking lot sweeping debris and dirt at a landfill.
- Follow the procedures below when cleaning heavy oily deposits:
  - Clean oily spots with absorbent materials.
  - Use a screen or filter fabric over inlet, then wash surfaces.

- Do not allow discharges to the storm drain.
- Vacuum/pump discharges to a tank or discharge to sanitary sewer.
- Appropriately dispose of spilled materials and absorbents.

Surface Repair

- Preheat, transfer or load hot bituminous material away from storm drain inlets.
- Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff.
- Cover and seal nearby storm drain inlets where applicable (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal.
- Use only as much water as necessary for dust control, to avoid runoff.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

Inspection

- Have designated personnel conduct inspections of parking facilities and stormwater conveyance systems associated with parking facilities on a regular basis.
- Inspect cleaning equipment/sweepers for leaks on a regular basis.

Training

- Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.
- Train employees and contractors in proper techniques for spill containment and cleanup.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials where it will be readily accessible or at a central location.
- Clean up fluid spills immediately with absorbent rags or material.
- Dispose of spilled material and absorbents properly.

Other Considerations

Limitations related to sweeping activities at large parking facilities may include high equipment costs, the need for sweeper operator training, and the inability of current sweeper technology to remove oil and grease.

Requirements

Costs

Cleaning/sweeping costs can be quite large. Construction and maintenance of stormwater structural controls can be quite expensive as well.

Maintenance

- Sweep parking lot regularly to minimize cleaning with water.
- Clean out oil/water/sand separators regularly, especially after heavy storms.
- Clean parking facilities regularly to prevent accumulated wastes and pollutants from being discharged into conveyance systems during rainy conditions.

Supplemental Information

Further Detail of the BMP

Surface Repair

Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff. Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal. Only use only as much water as is necessary for dust control to avoid runoff.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Objectives

- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	
Oxygen Demanding	☑

Description

Landscape maintenance activities include vegetation removal; herbicide and insecticide application; fertilizer application; watering; and other gardening and lawn care practices. Vegetation control typically involves a combination of chemical (herbicide) application and mechanical methods. All of these maintenance practices have the potential to contribute pollutants to the storm drain system. The major objectives of this BMP are to minimize the discharge of pesticides, herbicides and fertilizers to the storm drain system and receiving waters; prevent the disposal of landscape waste into the storm drain system by collecting and properly disposing of clippings and cuttings, and educating employees and the public.

Approach

Pollution Prevention

- Implement an integrated pest management (IPM) program. IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools.
- Choose low water using flowers, trees, shrubs, and groundcover.
- Consider alternative landscaping techniques such as naturescaping and xeriscaping.
- Conduct appropriate maintenance (i.e. properly timed fertilizing, weeding, pest control, and pruning) to help preserve the landscapes water efficiency.

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- Consider grass cycling (grass cycling is the natural recycling of grass by leaving the clippings on the lawn when mowing. Grass clippings decompose quickly and release valuable nutrients back into the lawn).

Suggested Protocols

Mowing, Trimming, and Weeding

- Whenever possible use mechanical methods of vegetation removal (e.g mowing with tractor-type or push mowers, hand cutting with gas or electric powered weed trimmers) rather than applying herbicides. Use hand weeding where practical.

- Avoid loosening the soil when conducting mechanical or manual weed control, this could lead to erosion. Use mulch or other erosion control measures when soils are exposed.

- Performing mowing at optimal times. Mowing should not be performed if significant rain events are predicted.

- Mulching mowers may be recommended for certain flat areas. Other techniques may be employed to minimize mowing such as selective vegetative planting using low maintenance grasses and shrubs.

- Collect lawn and garden clippings, pruning waste, tree trimmings, and weeds. Chip if necessary, and compost or dispose of at a landfill (see waste management section of this fact sheet).

- Place temporarily stockpiled material away from watercourses, and berm or cover stockpiles to prevent material releases to storm drains.

Planting

- Determine existing native vegetation features (location, species, size, function, importance) and consider the feasibility of protecting them. Consider elements such as their effect on drainage and erosion, hardiness, maintenance requirements, and possible conflicts between preserving vegetation and the resulting maintenance needs.

- Retain and/or plant selected native vegetation whose features are determined to be beneficial, where feasible. Native vegetation usually requires less maintenance (e.g., irrigation, fertilizer) than planting new vegetation.

- Consider using low water use groundcovers when planting or replanting.

Waste Management

- Compost leaves, sticks, or other collected vegetation or dispose of at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.

- Place temporarily stockpiled material away from watercourses and storm drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.

- Reduce the use of high nitrogen fertilizers that produce excess growth requiring more frequent mowing or trimming.

- Avoid landscape wastes in and around storm drain inlets by either using bagging equipment or by manually picking up the material.

Irrigation

- Where practical, use automatic timers to minimize runoff.

- Use popup sprinkler heads in areas with a lot of activity or where there is a chance the pipes may be broken. Consider the use of mechanisms that reduce water flow to sprinkler heads if broken.

- Ensure that there is no runoff from the landscaped area(s) if re-claimed water is used for irrigation.

- If bailing of muddy water is required (e.g. when repairing a water line leak), do not put it in the storm drain; pour over landscaped areas.

- Irrigate slowly or pulse irrigate to prevent runoff and then only irrigate as much as is needed.

- Apply water at rates that do not exceed the infiltration rate of the soil.

Fertilizer and Pesticide Management

- Utilize a comprehensive management system that incorporates integrated pest management (IPM) techniques. There are many methods and types of IPM, including the following:

  - Mulching can be used to prevent weeds where turf is absent, fencing installed to keep rodents out, and netting used to keep birds and insects away from leaves and fruit.

  - Visible insects can be removed by hand (with gloves or tweezers) and placed in soapy water or vegetable oil. Alternatively, insects can be sprayed off the plant with water or in some cases vacuumed off of larger plants.

  - Store-bought traps, such as species-specific, pheromone-based traps or colored sticky cards, can be used.

  - Slugs can be trapped in small cups filled with beer that are set in the ground so the slugs can get in easily.

  - In cases where microscopic parasites, such as bacteria and fungi, are causing damage to plants, the affected plant material can be removed and disposed of (pruning equipment should be disinfected with bleach to prevent spreading the disease organism).

  - Small mammals and birds can be excluded using fences, netting, tree trunk guards.

  - Beneficial organisms, such as bats, birds, green lacewings, ladybugs, praying mantis, ground beetles, parasitic nematodes, trichogramma wasps, seed head weevils, and spiders that prey on detrimental pest species can be promoted.

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.

- Use pesticides only if there is an actual pest problem (not on a regular preventative schedule).
- Do not use pesticides if rain is expected. Apply pesticides only when wind speeds are low (less than 5 mph).
- Do not mix or prepare pesticides for application near storm drains.
- Prepare the minimum amount of pesticide needed for the job and use the lowest rate that will effectively control the pest.
- Employ techniques to minimize off-target application (e.g. spray drift) of pesticides, including consideration of alternative application techniques.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Calibrate fertilizer and pesticide application equipment to avoid excessive application.
- Periodically test soils for determining proper fertilizer use.
- Sweep pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Purchase only the amount of pesticide that you can reasonably use in a given time period (month or year depending on the product).
- Triple rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Dispose of empty pesticide containers according to the instructions on the container label.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering, and repair leaks in the irrigation system as soon as they are observed.
- Inspect pesticide/fertilizer equipment and transportation vehicles daily.

Training

- Educate and train employees on use of pesticides and in pesticide application techniques to prevent pollution. Pesticide application must be under the supervision of a California qualified pesticide applicator.
- Train/encourage municipal maintenance crews to use IPM techniques for managing public green areas.
- Annually train employees within departments responsible for pesticide application on the appropriate portions of the agency's IPM Policy, SOPs, and BMPs, and the latest IPM techniques.

- Employees who are not authorized and trained to apply pesticides should be periodically (at least annually) informed that they cannot use over-the-counter pesticides in or around the workplace.

- Use a training log or similar method to document training.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup

- Have spill cleanup materials readily available and in a know in location

- Cleanup spills immediately and use dry methods if possible.

- Properly dispose of spill cleanup material.

Other Considerations

- The Federal Pesticide, Fungicide, and Rodenticide Act and California Title 3, Division 6, Pesticides and Pest Control Operations place strict controls over pesticide application and handling and specify training, annual refresher, and testing requirements. The regulations generally cover: a list of approved pesticides and selected uses, updated regularly; general application information; equipment use and maintenance procedures; and record keeping. The California Department of Pesticide Regulations and the County Agricultural Commission coordinate and maintain the licensing and certification programs. All public agency employees who apply pesticides and herbicides in "agricultural use" areas such as parks, golf courses, rights-of-way and recreation areas should be properly certified in accordance with state regulations. Contracts for landscape maintenance should include similar requirements.

- All employees who handle pesticides should be familiar with the most recent material safety data sheet (MSDS) files.

- Municipalities do not have the authority to regulate the use of pesticides by school districts, however the California Healthy Schools Act of 2000 (AB 2260) has imposed requirements on California school districts regarding pesticide use in schools. Posting of notification prior to the application of pesticides is now required, and IPM is stated as the preferred approach to pest management in schools.

Requirements

Costs

Additional training of municipal employees will be required to address IPM techniques and BMPs. IPM methods will likely increase labor cost for pest control which may be offset by lower chemical costs.

Maintenance

Not applicable

Supplemental Information

Further Detail of the BMP

Waste Management

Composting is one of the better disposal alternatives if locally available. Most municipalities either have or are planning yard waste composting facilities as a means of reducing the amount of waste going to the landfill. Lawn clippings from municipal maintenance programs as well as private sources would probably be compatible with most composting facilities

Contractors and Other Pesticide Users

Municipal agencies should develop and implement a process to ensure that any contractor employed to conduct pest control and pesticide application on municipal property engages in pest control methods consistent with the IPM Policy adopted by the agency. Specifically, municipalities should require contractors to follow the agency's IPM policy, SOPs, and BMPs; provide evidence to the agency of having received training on current IPM techniques when feasible; provide documentation of pesticide use on agency property to the agency in a timely manner.

References and Resources

King County Stormwater Pollution Control Manual. Best Management Practices for Businesses. 1995. King County Surface Water Management. July. On-line: http://dnr.metrokc.gov/wlr/dss/spcm.htm

Los Angeles County Stormwater Quality Model Programs. Public Agency Activities http://ladpw.org/wmd/npdes/model_links.cfm

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July. 1998.

Orange County Stormwater Program http://www.ocwatersheds.com/StormWater/swp_introduction.asp

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Landscaping and Lawn Care. Office of Water. Office of Wastewater Management. On-line: http://www.epa.gov/npdes/menuofbmps/poll_8.htm

Rain Garden

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- ☐ Minimize Impervious Land Coverage
- ☐ Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- ☐ Collect and Convey

Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say ¼ to ½ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

Foundation Planting

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Supplemental Information

Examples

- City of Ottawa's Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

Other Resources

Hager, Marty Catherine, Stormwater, "Low-Impact Development", January/February 2003. www.stormh2o.com

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD. www.lid-stormwater.net

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition

Design Objectives

☑ Maximize Infiltration

☑ Provide Retention

☑ Slow Runoff

Minimize Impervious Land Coverage

Prohibit Dumping of Improper Materials

Contain Pollutants

Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.

- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:

  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff

  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect

  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible

  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth

- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Trash Storage Areas SD-32

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.

- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

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- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of “ redevelopment” must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under “designing new installations” above should be followed.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Photo Credit: Geoff Brosseau

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Description

Many activities that occur at an industrial or commercial site have the potential to cause accidental or illegal spills. Preparation for accidental or illegal spills, with proper training and reporting systems implemented, can minimize the discharge of pollutants to the environment.

Spills and leaks are one of the largest contributors of stormwater pollutants. Spill prevention and control plans are applicable to any site at which hazardous materials are stored or used. An effective plan should have spill prevention and response procedures that identify potential spill areas, specify material handling procedures, describe spill response procedures, and provide spill clean-up equipment. The plan should take steps to identify and characterize potential spills, eliminate and reduce spill potential, respond to spills when they occur in an effort to prevent pollutants from entering the stormwater drainage system, and train personnel to prevent and control future spills.

Approach

Pollution Prevention

- Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.

- Develop a Spill Prevention Control and Countermeasure (SPCC) Plan. The plan should include:

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- Description of the facility, owner and address, activities and chemicals present
- Facility map
- Notification and evacuation procedures
- Cleanup instructions
- Identification of responsible departments
- Identify key spill response personnel

■ Recycle, reclaim, or reuse materials whenever possible. This will reduce the amount of process materials that are brought into the facility.

Suggested Protocols (including equipment needs)

Spill Prevention

■ Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.

■ If consistent illegal dumping is observed at the facility:

- Post “No Dumping” signs with a phone number for reporting illegal dumping and disposal. Signs should also indicate fines and penalties applicable for illegal dumping.
- Landscaping and beautification efforts may also discourage illegal dumping.
- Bright lighting and/or entrance barriers may also be needed to discourage illegal dumping.

■ Store and contain liquid materials in such a manner that if the tank is ruptured, the contents will not discharge, flow, or be washed into the storm drainage system, surface waters, or groundwater.

■ If the liquid is oil, gas, or other material that separates from and floats on water, install a spill control device (such as a tee section) in the catch basins that collects runoff from the storage tank area.

■ Routine maintenance:

- Place drip pans or absorbent materials beneath all mounted taps, and at all potential drip and spill locations during filling and unloading of tanks. Any collected liquids or soiled absorbent materials must be reused/recycled or properly disposed.
- Store and maintain appropriate spill cleanup materials in a location known to all near the tank storage area; and ensure that employees are familiar with the site’s spill control plan and/or proper spill cleanup procedures.
- Sweep and clean the storage area monthly if it is paved, *do not hose down the area to a storm drain.*

- Check tanks (and any containment sumps) daily for leaks and spills. Replace tanks that are leaking, corroded, or otherwise deteriorating with tanks in good condition. Collect all spilled liquids and properly dispose of them.

- Label all containers according to their contents (e.g., solvent, gasoline).

- Label hazardous substances regarding the potential hazard (corrosive, radioactive, flammable, explosive, poisonous).

- Prominently display required labels on transported hazardous and toxic materials (per US DOT regulations).

- Identify key spill response personnel.

Spill Control and Cleanup Activities

- Follow the Spill Prevention Control and Countermeasure Plan.

- Clean up leaks and spills immediately.

- Place a stockpile of spill cleanup materials where it will be readily accessible (e.g., near storage and maintenance areas).

- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste. Physical methods for the cleanup of dry chemicals include the use of brooms, shovels, sweepers, or plows.

- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.

- Chemical cleanups of material can be achieved with the use of adsorbents, gels, and foams. Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.

- For larger spills, a private spill cleanup company or Hazmat team may be necessary.

Reporting

- Report spills that pose an immediate threat to human health or the environment to the Regional Water Quality Control Board.

- Federal regulations require that any oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour).

- Report spills to local agencies, such as the fire department; they can assist in cleanup.

- Establish a system for tracking incidents. The system should be designed to identify the following:

  - Types and quantities (in some cases) of wastes

  - Patterns in time of occurrence (time of day/night, month, or year)

  - Mode of dumping (abandoned containers, “midnight dumping” from moving vehicles, direct dumping of materials, accidents/spills)

  - Responsible parties

Training

- Educate employees about spill prevention and cleanup.

- Well-trained employees can reduce human errors that lead to accidental releases or spills:

  - The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.

  - Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.

- Employees should be educated about aboveground storage tank requirements. Employees responsible for aboveground storage tanks and liquid transfers should be thoroughly familiar with the Spill Prevention Control and Countermeasure Plan and the plan should be readily available.

- Train employees to recognize and report illegal dumping incidents.

Other Considerations (Limitations and Regulations)

- A Spill Prevention Control and Countermeasure Plan (SPCC) is required for facilities that are subject to the oil pollution regulations specified in Part 112 of Title 40 of the Code of Federal Regulations or if they have a storage capacity of 10,000 gallons or more of petroleum. (Health and Safety Code 6.67)

- State regulations also exist for storage of hazardous materials (Health & Safety Code Chapter 6.95), including the preparation of area and business plans for emergency response to the releases or threatened releases.

- Consider requiring smaller secondary containment areas (less than 200 sq. ft.) to be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.

Requirements

Costs (including capital and operation & maintenance)

- Will vary depending on the size of the facility and the necessary controls.

- Prevention of leaks and spills is inexpensive. Treatment and/or disposal of contaminated soil or water can be quite expensive.

Maintenance (including administrative and staffing)

- This BMP has no major administrative or staffing requirements. However, extra time is needed to properly handle and dispose of spills, which results in increased labor costs.

Supplemental Information

Further Detail of the BMP

Reporting

Record keeping and internal reporting represent good operating practices because they can increase the efficiency of the facility and the effectiveness of BMPs. A good record keeping system helps the facility minimize incident recurrence, correctly respond with appropriate cleanup activities, and comply with legal requirements. A record keeping and reporting system should be set up for documenting spills, leaks, and other discharges, including discharges of hazardous substances in reportable quantities. Incident records describe the quality and quantity of non-stormwater discharges to the storm sewer. These records should contain the following information:

- Date and time of the incident
- Weather conditions
- Duration of the spill/leak/discharge
- Cause of the spill/leak/discharge
- Response procedures implemented
- Persons notified
- Environmental problems associated with the spill/leak/discharge

Separate record keeping systems should be established to document housekeeping and preventive maintenance inspections, and training activities. All housekeeping and preventive maintenance inspections should be documented. Inspection documentation should contain the following information:

- The date and time the inspection was performed
- Name of the inspector
- Items inspected
- Problems noted
- Corrective action required
- Date corrective action was taken

Other means to document and record inspection results are field notes, timed and dated photographs, videotapes, and drawings and maps.

Aboveground Tank Leak and Spill Control

Accidental releases of materials from aboveground liquid storage tanks present the potential for contaminating stormwater with many different pollutants. Materials spilled, leaked, or lost from tanks may accumulate in soils or on impervious surfaces and be carried away by stormwater runoff.

The most common causes of unintentional releases are:

- Installation problems
- Failure of piping systems (pipes, pumps, flanges, couplings, hoses, and valves)
- External corrosion and structural failure
- Spills and overfills due to operator error
- Leaks during pumping of liquids or gases from truck or rail car to a storage tank or vice versa

Storage of reactive, ignitable, or flammable liquids should comply with the Uniform Fire Code and the National Electric Code. Practices listed below should be employed to enhance the code requirements:

- Tanks should be placed in a designated area.
- Tanks located in areas where firearms are discharged should be encapsulated in concrete or the equivalent.
- Designated areas should be impervious and paved with Portland cement concrete, free of cracks and gaps, in order to contain leaks and spills.
- Liquid materials should be stored in UL approved double walled tanks or surrounded by a curb or dike to provide the volume to contain 10 percent of the volume of all of the containers or 110 percent of the volume of the largest container, whichever is greater. The area inside the curb should slope to a drain.
- For used oil or dangerous waste, a dead-end sump should be installed in the drain.
- All other liquids should be drained to the sanitary sewer if available. The drain must have a positive control such as a lock, valve, or plug to prevent release of contaminated liquids.
- Accumulated stormwater in petroleum storage areas should be passed through an oil/water separator.

Maintenance is critical to preventing leaks and spills. Conduct routine inspections and:

- Check for external corrosion and structural failure.
- Check for spills and overfills due to operator error.
- Check for failure of piping system (pipes, pumps, flanger, coupling, hoses, and valves).
- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.

- Visually inspect new tank or container installation for loose fittings, poor welding, and improper or poorly fitted gaskets.

- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.

- Frequently relocate accumulated stormwater during the wet season.

- Periodically conduct integrity testing by a qualified professional.

Vehicle Leak and Spill Control

Major spills on roadways and other public areas are generally handled by highly trained Hazmat teams from local fire departments or environmental health departments. The measures listed below pertain to leaks and smaller spills at vehicle maintenance shops.

In addition to implementing the spill prevention, control, and clean up practices above, use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- Perform all vehicle fluid removal or changing inside or under cover to prevent the run-on of stormwater and the runoff of spills.

- Regularly inspect vehicles and equipment for leaks, and repair immediately.

- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.

- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.

- Immediately drain all fluids from wrecked vehicles.

- Store wrecked vehicles or damaged equipment under cover.

- Place drip pans or absorbent materials under heavy equipment when not in use.

- Use adsorbent materials on small spills rather than hosing down the spill.

- Remove the adsorbent materials promptly and dispose of properly.

- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.

- Oil filters disposed of in trashcans or dumpsters can leak oil and contaminate stormwater. Place the oil filter in a funnel over a waste oil recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.

- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- Design the fueling area to prevent the run-on of stormwater and the runoff of spills:
  - Cover fueling area if possible.
  - Use a perimeter drain or slope pavement inward with drainage to a sump.
  - Pave fueling area with concrete rather than asphalt.
- If dead-end sump is not used to collect spills, install an oil/water separator.
- Install vapor recovery nozzles to help control drips as well as air pollution.
- Discourage "topping-off' of fuel tanks.
- Use secondary containment when transferring fuel from the tank truck to the fuel tank.
- Use adsorbent materials on small spills and general cleaning rather than hosing down the area. Remove the adsorbent materials promptly.
- Carry out all Federal and State requirements regarding underground storage tanks, or install above ground tanks.
- Do not use mobile fueling of mobile industrial equipment around the facility; rather, transport the equipment to designated fueling areas.
- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Train employees in proper fueling and cleanup procedures.

Industrial Spill Prevention Response

For the purposes of developing a spill prevention and response program to meet the stormwater regulations, facility managers should use information provided in this fact sheet and the spill prevention/response portions of the fact sheets in this handbook, for specific activities. The program should:

- Integrate with existing emergency response/hazardous materials programs (e.g., Fire Department)
- Develop procedures to prevent/mitigate spills to storm drain systems
- Identify responsible departments
- Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures
- Address spills at municipal facilities, as well as public areas

- Provide training concerning spill prevention, response and cleanup to all appropriate personnel

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Stormwater Managers Resource Center http://www.stormwatercenter.net/

Waste Handling & Disposal SC-34

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

Description

Improper storage and handling of solid wastes can allow toxic compounds, oils and greases, heavy metals, nutrients, suspended solids, and other pollutants to enter stormwater runoff. The discharge of pollutants to stormwater from waste handling and disposal can be prevented and reduced by tracking waste generation, storage, and disposal; reducing waste generation and disposal through source reduction, reuse, and recycling; and preventing run-on and runoff.

Approach

Pollution Prevention

- Accomplish reduction in the amount of waste generated using the following source controls:
  - Production planning and sequencing
  - Process or equipment modification
  - Raw material substitution or elimination
  - Loss prevention and housekeeping
  - Waste segregation and separation
  - Close loop recycling
- Establish a material tracking system to increase awareness about material usage. This may reduce spills and minimize contamination, thus reducing the amount of waste produced.
- Recycle materials whenever possible.

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Suggested Protocols

General

- Cover storage containers with leak proof lids or some other means. If waste is not in containers, cover all waste piles (plastic tarps are acceptable coverage) and prevent stormwater run-on and runoff with a berm. The waste containers or piles must be covered except when in use.

- Use drip pans or absorbent materials whenever grease containers are emptied by vacuum trucks or other means. Grease cannot be left on the ground. Collected grease must be properly disposed of as garbage.

- Check storage containers weekly for leaks and to ensure that lids are on tightly. Replace any that are leaking, corroded, or otherwise deteriorating.

- Sweep and clean the storage area regularly. If it is paved, do not hose down the area to a storm drain.

- Dispose of rinse and wash water from cleaning waste containers into a sanitary sewer if allowed by the local sewer authority. Do not discharge wash water to the street or storm drain.

- Transfer waste from damaged containers into safe containers.

- Take special care when loading or unloading wastes to minimize losses. Loading systems can be used to minimize spills and fugitive emission losses such as dust or mist. Vacuum transfer systems can minimize waste loss.

Controlling Litter

- Post “No Littering” signs and enforce anti-litter laws.

- Provide a sufficient number of litter receptacles for the facility.

- Clean out and cover litter receptacles frequently to prevent spillage.

Waste Collection

- Keep waste collection areas clean.

- Inspect solid waste containers for structural damage regularly. Repair or replace damaged containers as necessary.

- Secure solid waste containers; containers must be closed tightly when not in use.

- Do not fill waste containers with washout water or any other liquid.

- Ensure that only appropriate solid wastes are added to the solid waste container. Certain wastes such as hazardous wastes, appliances, fluorescent lamps, pesticides, etc., may not be disposed of in solid waste containers (see chemical/ hazardous waste collection section below).

- Do not mix wastes; this can cause chemical reactions, make recycling impossible, and complicate disposal.

Good Housekeeping

- Use all of the product before disposing of the container.
- Keep the waste management area clean at all times by sweeping and cleaning up spills immediately.
- Use dry methods when possible (e.g., sweeping, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.

Chemical/Hazardous Wastes

- Select designated hazardous waste collection areas on-site.
- Store hazardous materials and wastes in covered containers and protect them from vandalism.
- Place hazardous waste containers in secondary containment.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Stencil or demarcate storm drains on the facility's property with prohibitive message regarding waste disposal.

Run-on/Runoff Prevention

- Prevent stormwater run-on from entering the waste management area by enclosing the area or building a berm around the area.
- Prevent waste materials from directly contacting rain.
- Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropyleneor hypalon.
- Cover the area with a permanent roof if feasible.
- Cover dumpsters to prevent rain from washing waste out of holes or cracks in the bottom of the dumpster.
- Move the activity indoor after ensuring all safety concerns such as fire hazard and ventilation are addressed.

Inspection

- Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.
- Check waste management areas for leaking containers or spills.

- Repair leaking equipment including valves, lines, seals, or pumps promptly.

Training

- Train staff in pollution prevention measures and proper disposal methods.
- Train employees and contractors in proper spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.
- Train employees and subcontractors in proper hazardous waste management.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Have an emergency plan, equipment and trained personnel ready at all times to deal immediately with major spills
- Collect all spilled liquids and properly dispose of them.
- Store and maintain appropriate spill cleanup materials in a location known to all near the designated wash area.
- Ensure that vehicles transporting waste have spill prevention equipment that can prevent spills during transport. Spill prevention equipment includes:
  - Vehicles equipped with baffles for liquid waste
  - Trucks with sealed gates and spill guards for solid waste

Other Considerations (Limitations and Regulations)

Hazardous waste cannot be reused or recycled; it must be disposed of by a licensed hazardous waste hauler.

Requirements

Costs

Capital and O&M costs for these programs will vary substantially depending on the size of the facility and the types of waste handled. Costs should be low if there is an inventory program in place.

Maintenance

- None except for maintaining equipment for material tracking program.

Supplemental Information

Further Detail of the BMP

Land Treatment System

Minimize runoff of polluted stormwater from land application by:

- Choosing a site where slopes are under 6%, the soil is permeable, there is a low water table, it is located away from wetlands or marshes, and there is a closed drainage system

- Avoiding application of waste to the site when it is raining or when the ground is saturated with water
- Growing vegetation on land disposal areas to stabilize soils and reduce the volume of surface water runoff from the site
- Maintaining adequate barriers between the land application site and the receiving waters (planted strips are particularly good)
- Using erosion control techniques such as mulching and matting, filter fences, straw bales, diversion terracing, and sediment basins
- Performing routine maintenance to ensure the erosion control or site stabilization measures are working

Examples

The port of Long Beach has a state-of-the-art database for identifying potential pollutant sources, documenting facility management practices, and tracking pollutants.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

Solid Waste Container Best Management Practices – Fact Sheet On-Line Resources – Environmental Health and Safety. Harvard University. 2002.

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description

Areas within an industrial site that are bare of vegetation or are subject to activities that promote the suppression of vegetation are often subject to erosion. In addition, they may or may not be contaminated from past or current activities. If the area is temporarily bare because of construction, see SC-42, Building Repair, Remodeling, and Construction. Sites with excessive erosion or the potential for excessive erosion should consider employing the soil erosion BMPs identified in the Construction BMP Handbook. Note that this fact sheet addresses soils that are not so contaminated as to exceed hazardous waste criteria (see Title 22 California Code of Regulations for Hazardous Waste Criteria).

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

Preserve natural vegetation whenever possible. See also EC-2, Preservation of Existing Vegetation, in the Construction BMP Handbook.

Suggested Protocols

- Preserve natural vegetation.
- Analyze soil conditions.
- Re-vegetate when necessary.
- Remove contaminated soil.
- Utilize chemical stabilization when needed. See also EC-5, Soil Binders, and EC-13, Polyacrylamide, in the Construction BMP Handbook.
- Use geosynthetic membranes to control erosion if feasible. See also EC-7, Geotextiles and Mats, in the Construction BMP Handbook.

Training

Training is not a significant element of this best management practice.

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

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Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	
Organics	

Description

Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, abnormal pH, and oils and greases. Utilizing the protocols in this fact sheet will prevent or reduce the discharge of pollutants to stormwater from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, keeping debris from entering the storm drains, and maintaining the stormwater collection system.

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Encourage proper lawn management and landscaping, including use of native vegetation.

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- Encourage use of Integrated Pest Management techniques for pest control.

- Encourage proper onsite recycling of yard trimmings.

- Recycle residual paints, solvents, lumber, and other material as much as possible.

Suggested Protocols

Pressure Washing of Buildings, Rooftops, and Other Large Objects

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.

- If soaps or detergents are not used, and the surrounding area is paved, wash runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in the catch basin to trap the particles in wash water runoff.

- If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement.

Landscaping Activities

- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.

- Use mulch or other erosion control measures on exposed soils.

Building Repair, Remodeling, and Construction

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.

- Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.

- Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.

- Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.

- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. This is particularly necessary on rainy days. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and solids must be collected and disposed of before removing the containment device(s) at the end of the work day.

- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. If directed off-site, you should direct the water through hay bales and filter fabric or use other sediment filters or traps.

- Store toxic material under cover during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

Mowing, Trimming, and Planting

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.

- Use mulch or other erosion control measures when soils are exposed.

- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.

- Consider an alternative approach when bailing out muddy water: do not put it in the storm drain; pour over landscaped areas.

- Use hand weeding where practical.

Fertilizer and Pesticide Management

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.

- Use less toxic pesticides that will do the job when applicable. Avoid use of copper-based pesticides if possible.

- Do not use pesticides if rain is expected.

- Do not mix or prepare pesticides for application near storm drains.

- Use the minimum amount needed for the job.

- Calibrate fertilizer distributors to avoid excessive application.

- Employ techniques to minimize off-target application (e.g., spray drift) of pesticides, including consideration of alternative application techniques.

- Apply pesticides only when wind speeds are low.

- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.

- Irrigate slowly to prevent runoff and then only as much as is needed.

- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.

- Dispose of empty pesticide containers according to the instructions on the container label.

- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.

- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering and repair leaks in the irrigation system as soon as they are observed.

Training

- Educate and train employees on pesticide use and in pesticide application techniques to prevent pollution.

- Train employees and contractors in proper techniques for spill containment and cleanup.

- Be sure the frequency of training takes into account the complexity of the operations and the nature of the staff.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.

- Place a stockpile of spill cleanup materials, such as brooms, dustpans, and vacuum sweepers (if desired) near the storage area where it will be readily accessible.

- Have employees trained in spill containment and cleanup present during the loading/unloading of dangerous wastes, liquid chemicals, or other materials.

- Familiarize employees with the Spill Prevention Control and Countermeasure Plan.

- Clean up spills immediately.

Other Considerations

Alternative pest/weed controls may not be available, suitable, or effective in many cases.

Requirements

Costs

- Cost will vary depending on the type and size of facility.

- Overall costs should be low in comparison to other BMPs.

Maintenance

Sweep paved areas regularly to collect loose particles. Wipe up spills with rags and other absorbent material immediately, do not hose down the area to a storm drain.

Supplemental Information

Further Detail of the BMP

Fire Sprinkler Line Flushing

Building fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water, though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping, but it is subject to rusting and results in lower quality water. Initially, the black iron pipe has an oil coating to protect it from rusting between manufacture and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, poly-phosphates and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time (typically a year) and between flushes may accumulate iron, manganese, lead, copper, nickel, and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in fire sprinkler line water.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

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Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

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Objectives

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Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Description

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through stormwater runoff or non-stormwater discharges. The protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants from parking/storage areas and include using good housekeeping practices, following appropriate cleaning BMPs, and training employees.

Approach

The goal of this program is to ensure stormwater pollution prevention practices are considered when conducting activities on or around parking areas and storage areas to reduce potential for pollutant discharge to receiving waters. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Encourage alternative designs and maintenance strategies for impervious parking lots. (See New Development and Redevelopment BMP Handbook)

- Keep accurate maintenance logs to evaluate BMP implementation.

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Suggested Protocols

General

- Keep the parking and storage areas clean and orderly. Remove debris in a timely fashion.
- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low quantities.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Discharge soapy water remaining in mop or wash buckets to the sanitary sewer through a sink, toilet, clean-out, or wash area with drain.

Controlling Litter

- Post “No Littering” signs and enforce anti-litter laws.
- Provide an adequate number of litter receptacles.
- Clean out and cover litter receptacles frequently to prevent spillage.
- Provide trash receptacles in parking lots to discourage litter.
- Routinely sweep, shovel, and dispose of litter in the trash.

Surface Cleaning

- Use dry cleaning methods (e.g., sweeping, vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system if possible.
- Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- Sweep all parking lots at least once before the onset of the wet season.
- Follow the procedures below if water is used to clean surfaces:
  - Block the storm drain or contain runoff.
  - Collect and pump wash water to the sanitary sewer or discharge to a pervious surface. Do not allow wash water to enter storm drains.
  - Dispose of parking lot sweeping debris and dirt at a landfill.
- Follow the procedures below when cleaning heavy oily deposits:
  - Clean oily spots with absorbent materials.
  - Use a screen or filter fabric over inlet, then wash surfaces.

- Do not allow discharges to the storm drain.

- Vacuum/pump discharges to a tank or discharge to sanitary sewer.

- Appropriately dispose of spilled materials and absorbents.

Surface Repair

- Preheat, transfer or load hot bituminous material away from storm drain inlets.

- Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff.

- Cover and seal nearby storm drain inlets where applicable (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal.

- Use only as much water as necessary for dust control, to avoid runoff.

- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

Inspection

- Have designated personnel conduct inspections of parking facilities and stormwater conveyance systems associated with parking facilities on a regular basis.

- Inspect cleaning equipment/sweepers for leaks on a regular basis.

Training

- Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.

- Train employees and contractors in proper techniques for spill containment and cleanup.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.

- Place a stockpile of spill cleanup materials where it will be readily accessible or at a central location.

- Clean up fluid spills immediately with absorbent rags or material.

- Dispose of spilled material and absorbents properly.

Other Considerations

Limitations related to sweeping activities at large parking facilities may include high equipment costs, the need for sweeper operator training, and the inability of current sweeper technology to remove oil and grease.

Requirements

Costs

Cleaning/sweeping costs can be quite large. Construction and maintenance of stormwater structural controls can be quite expensive as well.

Maintenance

- Sweep parking lot regularly to minimize cleaning with water.
- Clean out oil/water/sand separators regularly, especially after heavy storms.
- Clean parking facilities regularly to prevent accumulated wastes and pollutants from being discharged into conveyance systems during rainy conditions.

Supplemental Information

Further Detail of the BMP

Surface Repair

Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff. Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal. Only use only as much water as is necessary for dust control to avoid runoff.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Landscape Maintenance SC-73

Objectives

- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	
Oxygen Demanding	☑

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Description

Landscape maintenance activities include vegetation removal; herbicide and insecticide application; fertilizer application; watering; and other gardening and lawn care practices. Vegetation control typically involves a combination of chemical (herbicide) application and mechanical methods. All of these maintenance practices have the potential to contribute pollutants to the storm drain system. The major objectives of this BMP are to minimize the discharge of pesticides, herbicides and fertilizers to the storm drain system and receiving waters; prevent the disposal of landscape waste into the storm drain system by collecting and properly disposing of clippings and cuttings, and educating employees and the public.

Approach

Pollution Prevention

- Implement an integrated pest management (IPM) program. IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools.
- Choose low water using flowers, trees, shrubs, and groundcover.
- Consider alternative landscaping techniques such as naturescaping and xeriscaping.
- Conduct appropriate maintenance (i.e. properly timed fertilizing, weeding, pest control, and pruning) to help preserve the landscapes water efficiency.

- Consider grass cycling (grass cycling is the natural recycling of grass by leaving the clippings on the lawn when mowing. Grass clippings decompose quickly and release valuable nutrients back into the lawn).

Suggested Protocols

Mowing, Trimming, and Weeding

- Whenever possible use mechanical methods of vegetation removal (e.g mowing with tractor-type or push mowers, hand cutting with gas or electric powered weed trimmers) rather than applying herbicides. Use hand weeding where practical.
- Avoid loosening the soil when conducting mechanical or manual weed control, this could lead to erosion. Use mulch or other erosion control measures when soils are exposed.
- Performing mowing at optimal times. Mowing should not be performed if significant rain events are predicted.
- Mulching mowers may be recommended for certain flat areas. Other techniques may be employed to minimize mowing such as selective vegetative planting using low maintenance grasses and shrubs.
- Collect lawn and garden clippings, pruning waste, tree trimmings, and weeds. Chip if necessary, and compost or dispose of at a landfill (see waste management section of this fact sheet).
- Place temporarily stockpiled material away from watercourses, and berm or cover stockpiles to prevent material releases to storm drains.

Planting

- Determine existing native vegetation features (location, species, size, function, importance) and consider the feasibility of protecting them. Consider elements such as their effect on drainage and erosion, hardiness, maintenance requirements, and possible conflicts between preserving vegetation and the resulting maintenance needs.
- Retain and/or plant selected native vegetation whose features are determined to be beneficial, where feasible. Native vegetation usually requires less maintenance (e.g., irrigation, fertilizer) than planting new vegetation.
- Consider using low water use groundcovers when planting or replanting.

Waste Management

- Compost leaves, sticks, or other collected vegetation or dispose of at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Place temporarily stockpiled material away from watercourses and storm drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Reduce the use of high nitrogen fertilizers that produce excess growth requiring more frequent mowing or trimming.

- Avoid landscape wastes in and around storm drain inlets by either using bagging equipment or by manually picking up the material.

Irrigation

- Where practical, use automatic timers to minimize runoff.
- Use popup sprinkler heads in areas with a lot of activity or where there is a chance the pipes may be broken. Consider the use of mechanisms that reduce water flow to sprinkler heads if broken.
- Ensure that there is no runoff from the landscaped area(s) if re-claimed water is used for irrigation.
- If bailing of muddy water is required (e.g. when repairing a water line leak), do not put it in the storm drain; pour over landscaped areas.
- Irrigate slowly or pulse irrigate to prevent runoff and then only irrigate as much as is needed.
- Apply water at rates that do not exceed the infiltration rate of the soil.

Fertilizer and Pesticide Management

- Utilize a comprehensive management system that incorporates integrated pest management (IPM) techniques. There are many methods and types of IPM, including the following:
  - Mulching can be used to prevent weeds where turf is absent, fencing installed to keep rodents out, and netting used to keep birds and insects away from leaves and fruit.
  - Visible insects can be removed by hand (with gloves or tweezers) and placed in soapy water or vegetable oil. Alternatively, insects can be sprayed off the plant with water or in some cases vacuumed off of larger plants.
  - Store-bought traps, such as species-specific, pheromone-based traps or colored sticky cards, can be used.
  - Slugs can be trapped in small cups filled with beer that are set in the ground so the slugs can get in easily.
  - In cases where microscopic parasites, such as bacteria and fungi, are causing damage to plants, the affected plant material can be removed and disposed of (pruning equipment should be disinfected with bleach to prevent spreading the disease organism).
  - Small mammals and birds can be excluded using fences, netting, tree trunk guards.
  - Beneficial organisms, such as bats, birds, green lacewings, ladybugs, praying mantis, ground beetles, parasitic nematodes, trichogramma wasps, seed head weevils, and spiders that prey on detrimental pest species can be promoted.
- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.

- Use pesticides only if there is an actual pest problem (not on a regular preventative schedule).
- Do not use pesticides if rain is expected. Apply pesticides only when wind speeds are low (less than 5 mph).
- Do not mix or prepare pesticides for application near storm drains.
- Prepare the minimum amount of pesticide needed for the job and use the lowest rate that will effectively control the pest.
- Employ techniques to minimize off-target application (e.g. spray drift) of pesticides, including consideration of alternative application techniques.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Calibrate fertilizer and pesticide application equipment to avoid excessive application.
- Periodically test soils for determining proper fertilizer use.
- Sweep pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Purchase only the amount of pesticide that you can reasonably use in a given time period (month or year depending on the product).
- Triple rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Dispose of empty pesticide containers according to the instructions on the container label.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering, and repair leaks in the irrigation system as soon as they are observed.
- Inspect pesticide/fertilizer equipment and transportation vehicles daily.

Training

- Educate and train employees on use of pesticides and in pesticide application techniques to prevent pollution. Pesticide application must be under the supervision of a California qualified pesticide applicator.
- Train/encourage municipal maintenance crews to use IPM techniques for managing public green areas.
- Annually train employees within departments responsible for pesticide application on the appropriate portions of the agency's IPM Policy, SOPs, and BMPs, and the latest IPM techniques.

- Employees who are not authorized and trained to apply pesticides should be periodically (at least annually) informed that they cannot use over-the-counter pesticides in or around the workplace.

- Use a training log or similar method to document training.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup

- Have spill cleanup materials readily available and in a know in location

- Cleanup spills immediately and use dry methods if possible.

- Properly dispose of spill cleanup material.

Other Considerations

- The Federal Pesticide, Fungicide, and Rodenticide Act and California Title 3, Division 6, Pesticides and Pest Control Operations place strict controls over pesticide application and handling and specify training, annual refresher, and testing requirements. The regulations generally cover: a list of approved pesticides and selected uses, updated regularly; general application information; equipment use and maintenance procedures; and record keeping. The California Department of Pesticide Regulations and the County Agricultural Commission coordinate and maintain the licensing and certification programs. All public agency employees who apply pesticides and herbicides in “agricultural use” areas such as parks, golf courses, rights-of-way and recreation areas should be properly certified in accordance with state regulations. Contracts for landscape maintenance should include similar requirements.

- All employees who handle pesticides should be familiar with the most recent material safety data sheet (MSDS) files.

- Municipalities do not have the authority to regulate the use of pesticides by school districts, however the California Healthy Schools Act of 2000 (AB 2260) has imposed requirements on California school districts regarding pesticide use in schools. Posting of notification prior to the application of pesticides is now required, and IPM is stated as the preferred approach to pest management in schools.

Requirements

Costs

Additional training of municipal employees will be required to address IPM techniques and BMPs. IPM methods will likely increase labor cost for pest control which may be offset by lower chemical costs.

Maintenance

Not applicable

Supplemental Information

Further Detail of the BMP

Waste Management

Composting is one of the better disposal alternatives if locally available. Most municipalities either have or are planning yard waste composting facilities as a means of reducing the amount of waste going to the landfill. Lawn clippings from municipal maintenance programs as well as private sources would probably be compatible with most composting facilities

Contractors and Other Pesticide Users

Municipal agencies should develop and implement a process to ensure that any contractor employed to conduct pest control and pesticide application on municipal property engages in pest control methods consistent with the IPM Policy adopted by the agency. Specifically, municipalities should require contractors to follow the agency's IPM policy, SOPs, and BMPs; provide evidence to the agency of having received training on current IPM techniques when feasible; provide documentation of pesticide use on agency property to the agency in a timely manner.

References and Resources

King County Stormwater Pollution Control Manual. Best Management Practices for Businesses. 1995. King County Surface Water Management. July. On-line: http://dnr.metrokc.gov/wlr/dss/spcm.htm

Los Angeles County Stormwater Quality Model Programs. Public Agency Activities http://ladpw.org/wmd/npdes/model_links.cfm

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July. 1998.

Orange County Stormwater Program http://www.ocwatersheds.com/StormWater/swp_introduction.asp

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Landscaping and Lawn Care. Office of Water. Office of Wastewater Management. On-line: http://www.epa.gov/npdes/menuofbmps/poll_8.htm

Roof Runoff Controls SD-11

Rain Garden

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain

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barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say ¼ to ½ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

Foundation Planting

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Supplemental Information

Examples

- City of Ottawa's Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

Other Resources

Hager, Marty Catherine, Stormwater, "Low-Impact Development", January/February 2003. www.stormh2o.com

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD. www.lid-stormwater.net

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition

Design Objectives

☑ Maximize Infiltration

☑ Provide Retention

☑ Slow Runoff

Minimize Impervious Land Coverage

Prohibit Dumping of Improper Materials

Contain Pollutants

Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of “ redevelopment” must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under “designing new installations” above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Trash Storage Areas SD-32

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.

- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

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- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Attachment C

WQMP Maintenance Agreement

RECORDING REQUESTED BY:
WHEN RECORDED RETURN TO:

City of San Bernardino
Community Development Department
300 North "D" Street
San Bernardino, CA 92418

No Fee Government Code 27383

SPACE ABOVE THIS LINE FOR RECORDER'S USE

AGREEMENT

STORMWATER TREATMENT DEVICE AND CONTROL MEASURE ACCESS AND MAINTENANCE AGREEMENT

Owner: ____

Tract No.: ______________________ **APN:** ______________________

Address: ____

THIS AGREEMENT is made and entered into this ___ day of _____, 20__, between the City of San Bernardino, a Charter City and municipal corporation, ("City") and Owner. The Owner and the City are sometimes each individually referred to herein as a "Party" and, collectively, as the "Parties."

RECITALS

WHEREAS, the Owner owns real property ("Property") in the City specifically described in Exhibits "A" and "B" which are attached hereto and incorporated herein by this reference; and

WHEREAS, at the time of approval of the Owner's development project commonly known as ________________ (the "Project"), the City required the Project to employ on-site control measures to minimize pollutants in urban stormwater runoff; and

WHEREAS, the Owner has chosen to install ______________________________________ [e.g. vegetated swales, drain inserts, media filters, pervious building material and other control measures] (the "Devices") to minimize pollutants in urban stormwater runoff; and

WHEREAS, the Devices having been installed in accordance with plans and specifications approved by the City; and

WHEREAS, the Devices being installed on private property and draining only private property, are private facilities with all maintenance or replacement therefore being the sole responsibility of the Owner; and

WHEREAS, the Owner is aware that periodic and continuous maintenance including, but not necessarily limited to, filter material replacement and sediment removal as specified in the site's Water Quality Management Plan (WQMP) is required to assure proper performance of the Devices; and

WHEREAS, the Owner is also aware that such maintenance activity will require compliance with all Federal, State and local laws and regulations, including those pertaining to confined space and waste disposal methods in effect at the time such maintenance occurs; and

WHEREAS, California Regional Water Quality Control Board Order No. R8-2010-0036 (NPDES No. CAS 618036) San Bernardino County Municipal Separate Storm Sewer System (MS4) Permit and San Bernardino Municipal Code Section 8.80.208 requires this Stormwater Treatment Device and Control Measure Access and Maintenance Agreement;

NOW, THEREFORE, in consideration of the City's approval of the Project and the mutual promises contained herein, the City of San Bernardino and Owner agree as follows:

AGREEMENT

1. The Owner hereby provides the City and its designees with full right of access to the Devices and the Owner's Property in the immediate vicinity of the Devices (a) at any time, upon reasonable notice; or (b) in the event of emergency, as determined by City's Community Development Director with no advance notice; for the purpose of inspecting, sampling and testing of the Devices, and in cases of emergency, to undertake all necessary repairs or other preventative measures at the Owner's expense as provided for in Section 3, below. The City shall make every effort at all times to minimize or avoid interference with the Owner's use of the Property when undertaking such inspections and repairs.

2. The Owner shall diligently maintain the Devices in a manner consistent with the manufacturers' recommended maintenance schedule or the maintenance schedule supplied in the site's WQMP to ensure efficient performance. All reasonable precautions shall be exercised by the Owner and the Owner's representatives in the removal and extraction of materials from the Devices, and the ultimate disposal of the materials in a manner consistent with all applicable laws. As may be requested from time to time by the City, the Owner shall provide the City with documentation identifying the materials removed, the quantity and the location of disposal destinations, as appropriate.

3. In the event the Owner fails to perform the necessary maintenance required by this Agreement within thirty (30) days of being given written notice by the City to do so, setting forth with specificity the action to be taken, the City is authorized to cause any maintenance necessary to be done and charge the entire cost and expense to the Owner, including administrative costs, attorneys' fees and interest thereon at the maximum rate authorized by law. Owner agrees that City may record a lien against the Property twenty (20) days after the City sends Owner the notice of charges if said charges have not been paid in full by Owner.

4. This Agreement shall be recorded in the Official Records of the County of San Bernardino at the expense of the Owner and shall constitute notice to all successors and assigns to the title to the Property of the obligations herein set forth.

5. In the event any action is commenced to enforce or interpret any of the terms or conditions of this Agreement the prevailing Party shall, in addition to any costs and other relief, be entitled to the recovery of its reasonable attorneys' fees. The costs, salary and expenses of the City Attorney and members of his office in enforcing this Agreement on behalf of the City shall be considered "attorney's fees" for the purposes of this Agreement.

6. It is the intent of the Parties that the burdens and benefits herein undertaken shall constitute equitable servitudes that run with the Property and shall be binding upon future owners of all or any portion of the Property. Any owner's liability hereunder shall terminate at the time it ceases to be an owner of the encumbered Property, except for obligations which accrue prior to the date of transfer by such owner, which shall remain the personal obligation of such owner.

7. Time is of the essence in the performance of this Agreement.

8. Any notice to a Party required or called for in this Agreement shall be served in person, or by deposit in the U.S. Mail, first class postage prepaid, to the address set forth below. Notice(s) shall be deemed effective upon receipt, or seventy-two (72) hours after deposit in the U.S. Mail, whichever is earlier. A Party may change notice address only by providing written notice thereof to the other Party.

CITY	OWNER
Community Development Director City of San Bernardino 300, North "D" Street San Bernardino, CA 92418	

9. This Agreement shall be governed by and construed in accordance with the laws of the State of California.

10. Any amendment to this Agreement shall be in writing and approved by the Community Development Director of the City and signed by the City and the Owner.

I, THE UNDERSIGNED, HAVE A SUFFICIENT OWNERSHIP INTEREST IN THE PROPERTY HEREIN TO CONSENT TO THE IMPOSITION OF A LIEN THEREON, AND HAVE READ AND UNDERSTAND THE FOREGOING AND, BY MY SIGNATURE, AGREE TO COMPLY IN ALL RESPECTS WITH THE CONDITIONS OF THIS AGREEMENT AND *DO* ***HEREBY PERSONALLY GUARANTEE*** THE PAYMENT OF THESE FEES AND FURTHER AGREE TO THE PLACEMENT OF A LIEN AS DESCRIBED ABOVE ON THE PROPERTY.

Name of Company ____

Signature ____

Name ______________________ Title ________________

(please print)

Mailing address ____

City ________________ State ______ Zip ________

Phone ________________

APPROVED AS TO CONTENT:

By:____

Mark Persico, Director
Community Development Department
City of San Bernardino

NOTE: All Signatures Must be Acknowledged by a Notary Public.

Structural and Treatment Control BMPS Operation and Maintenance Plan

For:

Clean Energy

E. Central Avenue & Tippecanoe Avenue

San Bernardino, CA

Prepared for:

Clean Energy

4675 Mac Arthur Court, Ste. 800

Newport Beach, CA, 92660

949.437.1000

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I. Inspection and Maintenance Logs

Inspection and Maintenance Logs are in the Appendix.

II. Updates, Revisions, and Errata

III. Introduction

The subject site consists of a gated parking to the north on 5 acres with a equipment and short fueling station to the southwest of the site on 1.75 acres. Proposed overland runoff sheets flows generally in a southwesterly direction. The site is not subjected to off-site runon.

The proposed project will comprise of a single drainage management area with treatment of two infiltration basins. Both will discharge any excess runoff through a storm drain line that leads to the street curb face parkway drain on East Central Ave.

IV. Responsibility for Maintenance

A. General

1) Name and contact information for responsible individual:

Linda Green Alshuler
MLG SD Land LLC, a California LLC
2182 Vista Entrada, Newport Beach CA 92660
714-812-0011

2) The owner or his designee will be responsible for onsite maintenance and operations.

3) Maintenance funding is part of business operating budget.

B. Staff Training Program: Operation and Maintenance procedures for stormwater BMPs shall be part of regular employee orientation and training.

C. Records: Records shall be maintained onsite.

D. Safety: Personnel shall perform duties consistent with local and CAL-OSHA employee safety regulations.

V. Summary of Drainage Management Areas and Stormwater BMPs

Please refer to the description in Section III and the WQMP Plan included in the Project-Specific WQMP.

VI. Maintenance Schedule or Matrix

Infiltration Systems

Infiltration facility maintenance should include frequent inspections to ensure that water infiltrates into the subsurface completely within the recommended infiltration time of 72 hours or less after a storm. The proposed maintenance procedures shall be incorporated into the routine landscaping maintenance of the property.

The following are general maintenance requirements:

1. If water is noticed in the basin more than 72 hours after a major storm or in the observation well of the infiltration trench more than 48 hours after a major storm, the infiltration facility may be clogged. Maintenance activities triggered by a potentially clogged facility include:

    a. Check for debris/sediment accumulation, rake surface and remove sediment (if any) and evaluate potential sources of sediment and vegetative or other debris (e.g., embankment erosion, channel scour, overhanging trees, etc). If suspected upland sources are outside of the County's jurisdiction, additional pretreatment operations (e.g., trash racks, vegetated swales, etc.) may be necessary.

    b. For basins, removal of the top layer of native soil may be required to restore infiltrative capacity.

2. Any debris or algae growth located on top of the infiltration facility should be removed and disposed of properly.

3. Facilities should be inspected annually. Trash and debris should be removed as needed, but at least annually prior to the beginning of the wet season.

4. Site vegetation should be maintained as frequently as necessary to maintain the aesthetic appearance of the site, and as follows:

    a. Vegetation, large shrubs, or trees that limit access or interfere with basin operation should be pruned or removed.

    b. Slope areas that have become bare should be revegetated and eroded areas should be regraded prior to being revegetated.

    c. Grass should be mowed to 4”-9” high and grass clippings should be removed.

    d. Fallen leaves and debris from deciduous plant foliage should be raked and removed.

    e. Invasive vegetation, such as Alligatorweed (Alternanthera philoxeroides), Halogeton (Halogeton glomeratus), Spotted Knapweed (Centaurea maculosa), Giant Reed (Arundo donax), Castor Bean (Ricinus communis), Perennial Pepperweed (Lepidium latifolium), and Yellow Starthistle (Centaurea solstitalis) must be removed and replaced with non- invasive species. Invasive species should never contribute more than 25% of the vegetated area. For more information on invasive weeds, including biology and control of listed weeds, look at the “encycloweedia” located at the California Department of Food and Agriculture website at http://www.cdfa.ca.gov/wma or the California Invasive Plant Council website at http://portal.cal-ipc.org/weedlist. .

f. Dead vegetation should be removed if it exceeds 10% of area coverage. Vegetation should be replaced immediately to maintain cover density and control erosion where soils are exposed.

g. Excess sediment buildup should be removed. Sediment should be removed when 6 inches of sediment accumulates. Sediments should be tested for toxic substance accumulation in compliance with current disposal requirements if visual or olfactory indications of pollution are noticed. If toxic substances are encountered at concentrations exceeding thresholds of Title 22, Section 66261 of the California Code of Regulations, the sediment must be disposed of in a hazardous waste landfill and the source of the contaminated sediments should be investigated and mitigated to the extent possible.

h. Following sediment removal activities, replanting and/or reseeding of vegetation may be required for reestablishment.

	Inspection and Maintenance Activities Summary
Routine Maintenance	• Remove trash and debris as required
	• Repair and reseed erosion near inlet if necessary
	• Remove any visual evidence of contamination from floatables such as oil and grease
	• Remove minor sediment accumulation, debris, and obstructions near inlets and outlet structures as needed.
	• Mow routinely to maintain ideal grass height and to suppress weeds
	• Periodically observe function under wet weather conditions
	• Take photographs before and after maintenance
Major Maintenance	• Repair structural damage to flow control structures including inlet, outlet, and overflow structures
	• De-thatch grass to remove accumulated sediment and aerate compacted areas to promote infiltration

Routine Maintenance for Infiltration Systems

Defect	Condition When Maintenance is Needed	Results Expected when Maintenance is Performed	Frequency
Trash & Debris	Any trash and debris which exceed 5 cubic feet per 1000 square feet (one standard garbage can). In general there should be no visual evidence of dumping. If less than threshold, all trash and debris will be removed as part of next scheduled maintenance.	Trash and debris cleared from site	Annually prior to wet season. After major storm events. (>0.75 in/24 hours) if spot checks indicate widespread damage and/or maintenance needs. Litter removal is dependent on site conditions and desired aesthetics and should be done at a frequency to meet those objectives.
Inlet Erosion	Visible evidence of erosion occurring near inlet structures.	Eroded areas repaired/reseeded	
Visual Contaminants and Pollution	Any evidence of oil, gasoline, contaminants, or other pollutants.	No contaminants or pollutants present.	
Slow Drain Time	Standing water long after storm has passed (after 72 hours) indicates that design drain times are not being achieved	Water drains within 72 hours. Accumulated litter on surface is removed, and top 1” to 2” of soil is raked or replaced.	
Inlets Blocked	Trash and debris or sediment blocking inlet structures	Inlets clear and free of trash and debris.	
Appearance of Poisonous, Noxious, or Nuisance Vegetation	Excessive grass and weed growth. Noxious weeds, woody vegetation establishing. Turf growing over rock filter.	Vegetation is mowed or trimmed to restore function. Weeds are removed to prevent noxious and nuisance plants from becoming established.	Monthly or as part of normal landscaping service, whichever is more frequent.

Attachment D

Supporting Documentation

WQMP Project Report

County of San Bernardino Stormwater Program

Santa Ana River Watershed Geodatabase

Thursday, November 16, 2017

Note: The information provided in this report and on the Stormwater Geodatabase for the County of San Bernardino Stormwater Program is intended to provide basic guidance in the preparation of the applicant's Water Quality Management Plan (WQMP) and should not be relied upon without independent verification.

Project Site Parcel Number(s):	028009120, 028009126, 028009123
Project Site Acreage:	2.729
HCOC Exempt Area:	Yes. Verify that the project is completely with the HCOC exemption area.
Closest Receiving Waters: (Applicant to verify based on local drainage facilities and topography.)	**System Number** - 701 **Facility Name** - Santa Ana River **Owner** - SBCFCD
Closest channel segment's susceptibility to Hydromodification:	EHM
Highest downstream hydromodification susceptibility:	High
Is this drainage segment subject to TMDLs?	No
Are there downstream drainage segments subject to TMDLs?	No
Is this drainage segment a 303d listed stream?	No
Are there 303d listed streams downstream?	Yes
Are there unlined downstream waterbodies?	No
Project Site Onsite Soil Group(s):	A
Environmentally Sensitive Areas within 200':	SAN BERNARDINO KANGAROO RAT
Groundwater Depth (FT):	-185
Parcels with potential septic tanks within 1000':	No
Known Groundwater Contamination Plumes within 1000':	Yes
Studies and Reports Related to Project Site:	CSDP No. 7 Storm Drain Systems CSDP No. 7 Storm Drain Systems CSDP No. 7 Storm Drain Systems CSDP No. 7 Storm Drain Hydraulic Design Data School Site Map Comprehensive Storm Drain Plan SBVMWD High Groundwater / Pressure Zone Area

NOAA Atlas 14, Volume 6, Version 2
Location name: San Bernardino, California, USA*
Latitude: 34.0862°, Longitude: -117.2606°
Elevation: 1058.57 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.100** (0.083-0.122)	**0.132** (0.110-0.160)	**0.174** (0.144-0.212)	**0.208** (0.171-0.256)	**0.255** (0.203-0.325)	**0.292** (0.227-0.379)	**0.329** (0.250-0.439)	**0.368** (0.271-0.505)	**0.421** (0.297-0.602)	**0.462** (0.315-0.686)
10-min	**0.144** (0.120-0.174)	**0.189** (0.157-0.230)	**0.249** (0.207-0.304)	**0.299** (0.246-0.367)	**0.366** (0.291-0.466)	**0.418** (0.325-0.544)	**0.472** (0.358-0.629)	**0.527** (0.388-0.723)	**0.603** (0.426-0.863)	**0.663** (0.452-0.983)
15-min	**0.174** (0.145-0.211)	**0.229** (0.190-0.278)	**0.302** (0.250-0.368)	**0.361** (0.297-0.444)	**0.443** (0.352-0.563)	**0.506** (0.393-0.657)	**0.571** (0.433-0.760)	**0.638** (0.470-0.875)	**0.730** (0.515-1.04)	**0.802** (0.546-1.19)
30-min	**0.258** (0.214-0.313)	**0.339** (0.282-0.413)	**0.447** (0.371-0.545)	**0.536** (0.440-0.658)	**0.657** (0.522-0.835)	**0.750** (0.583-0.975)	**0.846** (0.642-1.13)	**0.946** (0.697-1.30)	**1.08** (0.764-1.55)	**1.19** (0.810-1.76)
60-min	**0.378** (0.314-0.458)	**0.498** (0.414-0.605)	**0.656** (0.543-0.799)	**0.785** (0.645-0.965)	**0.962** (0.764-1.22)	**1.10** (0.855-1.43)	**1.24** (0.940-1.65)	**1.39** (1.02-1.90)	**1.59** (1.12-2.27)	**1.74** (1.19-2.58)
2-hr	**0.542** (0.451-0.657)	**0.700** (0.582-0.850)	**0.907** (0.752-1.11)	**1.08** (0.885-1.32)	**1.31** (1.04-1.66)	**1.49** (1.15-1.93)	**1.67** (1.26-2.22)	**1.85** (1.36-2.54)	**2.11** (1.49-3.01)	**2.30** (1.57-3.41)
3-hr	**0.665** (0.553-0.806)	**0.852** (0.708-1.03)	**1.10** (0.910-1.34)	**1.30** (1.07-1.60)	**1.57** (1.25-2.00)	**1.78** (1.39-2.31)	**1.99** (1.51-2.66)	**2.21** (1.63-3.04)	**2.51** (1.77-3.59)	**2.74** (1.87-4.06)
6-hr	**0.921** (0.766-1.12)	**1.17** (0.975-1.43)	**1.51** (1.25-1.83)	**1.78** (1.46-2.18)	**2.14** (1.70-2.72)	**2.42** (1.88-3.15)	**2.71** (2.05-3.61)	**3.00** (2.21-4.12)	**3.40** (2.40-4.86)	**3.70** (2.52-5.49)
12-hr	**1.21** (1.01-1.47)	**1.55** (1.29-1.89)	**2.00** (1.66-2.44)	**2.36** (1.94-2.90)	**2.86** (2.27-3.63)	**3.23** (2.51-4.20)	**3.62** (2.74-4.82)	**4.01** (2.95-5.50)	**4.54** (3.20-6.50)	**4.95** (3.37-7.34)
24-hr	**1.61** (1.43-1.86)	**2.09** (1.85-2.42)	**2.72** (2.40-3.15)	**3.23** (2.83-3.77)	**3.93** (3.32-4.73)	**4.46** (3.70-5.48)	**5.00** (4.05-6.29)	**5.55** (4.38-7.19)	**6.30** (4.77-8.50)	**6.88** (5.04-9.60)
2-day	**1.97** (1.74-2.26)	**2.59** (2.29-2.99)	**3.42** (3.01-3.95)	**4.09** (3.58-4.77)	**5.01** (4.25-6.04)	**5.72** (4.75-7.04)	**6.45** (5.23-8.13)	**7.20** (5.68-9.32)	**8.22** (6.22-11.1)	**9.02** (6.60-12.6)
3-day	**2.11** (1.87-2.43)	**2.82** (2.49-3.25)	**3.76** (3.32-4.35)	**4.54** (3.97-5.29)	**5.60** (4.75-6.75)	**6.43** (5.34-7.91)	**7.29** (5.90-9.18)	**8.17** (6.44-10.6)	**9.39** (7.10-12.7)	**10.3** (7.56-14.4)
4-day	**2.24** (1.99-2.59)	**3.03** (2.68-3.49)	**4.07** (3.59-4.71)	**4.94** (4.32-5.76)	**6.14** (5.20-7.39)	**7.07** (5.87-8.70)	**8.04** (6.51-10.1)	**9.04** (7.13-11.7)	**10.4** (7.89-14.1)	**11.5** (8.43-16.1)
7-day	**2.58** (2.28-2.97)	**3.54** (3.13-4.08)	**4.82** (4.25-5.58)	**5.89** (5.16-6.87)	**7.38** (6.25-8.89)	**8.55** (7.09-10.5)	**9.75** (7.90-12.3)	**11.0** (8.69-14.3)	**12.8** (9.67-17.2)	**14.2** (10.4-19.8)
10-day	**2.80** (2.48-3.22)	**3.87** (3.42-4.47)	**5.32** (4.69-6.16)	**6.53** (5.72-7.62)	**8.22** (6.96-9.91)	**9.55** (7.93-11.7)	**10.9** (8.86-13.8)	**12.4** (9.77-16.0)	**14.4** (10.9-19.4)	**16.0** (11.7-22.3)
20-day	**3.43** (3.04-3.96)	**4.81** (4.26-5.55)	**6.69** (5.90-7.74)	**8.27** (7.24-9.65)	**10.5** (8.89-12.6)	**12.3** (10.2-15.1)	**14.1** (11.4-17.8)	**16.0** (12.6-20.8)	**18.8** (14.2-25.3)	**20.9** (15.3-29.2)
30-day	**4.05** (3.59-4.67)	**5.68** (5.02-6.55)	**7.90** (6.97-9.14)	**9.78** (8.56-11.4)	**12.4** (10.5-15.0)	**14.6** (12.1-17.9)	**16.8** (13.6-21.1)	**19.1** (15.1-24.7)	**22.4** (17.0-30.2)	**25.1** (18.3-34.9)
45-day	**4.87** (4.32-5.62)	**6.77** (5.99-7.81)	**9.38** (8.27-10.8)	**11.6** (10.1-13.5)	**14.7** (12.5-17.7)	**17.2** (14.3-21.2)	**19.9** (16.1-25.0)	**22.7** (17.9-29.4)	**26.6** (20.1-35.9)	**29.8** (21.8-41.6)
60-day	**5.73** (5.07-6.60)	**7.86** (6.95-9.07)	**10.8** (9.52-12.5)	**13.3** (11.6-15.5)	**16.8** (14.3-20.3)	**19.7** (16.3-24.2)	**22.7** (18.4-28.6)	**25.9** (20.4-33.5)	**30.4** (23.0-41.0)	**34.0** (24.9-47.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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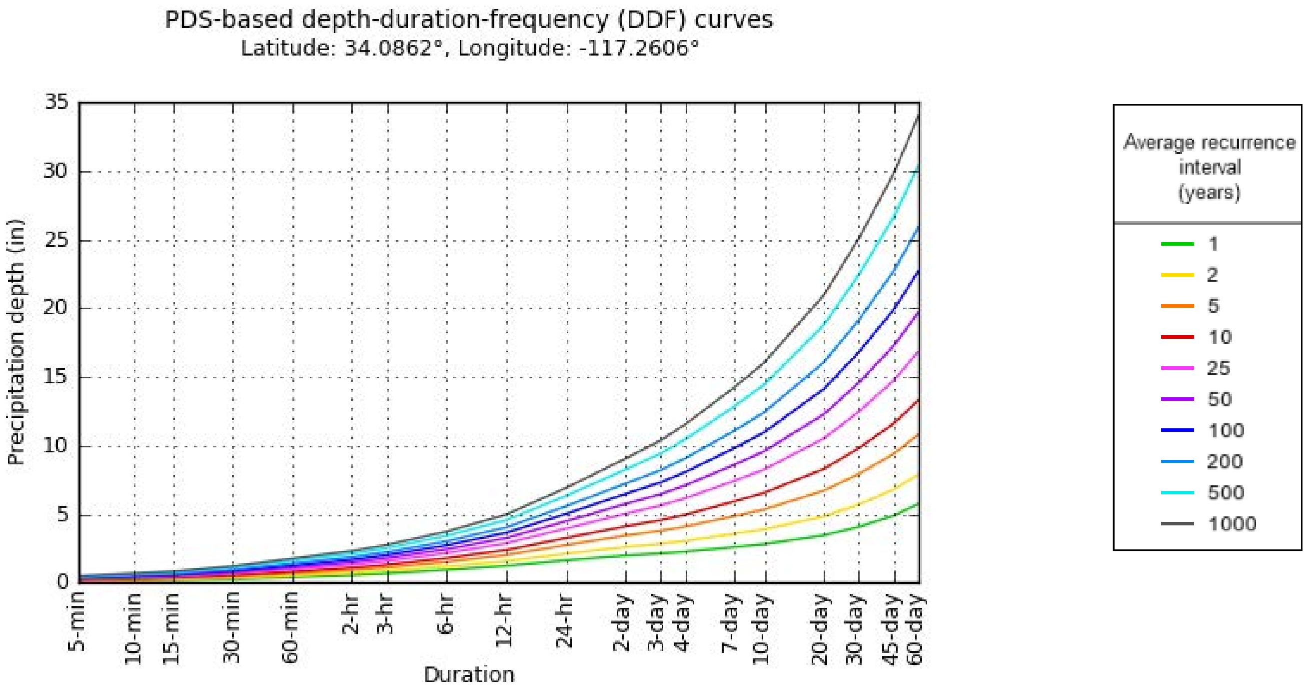
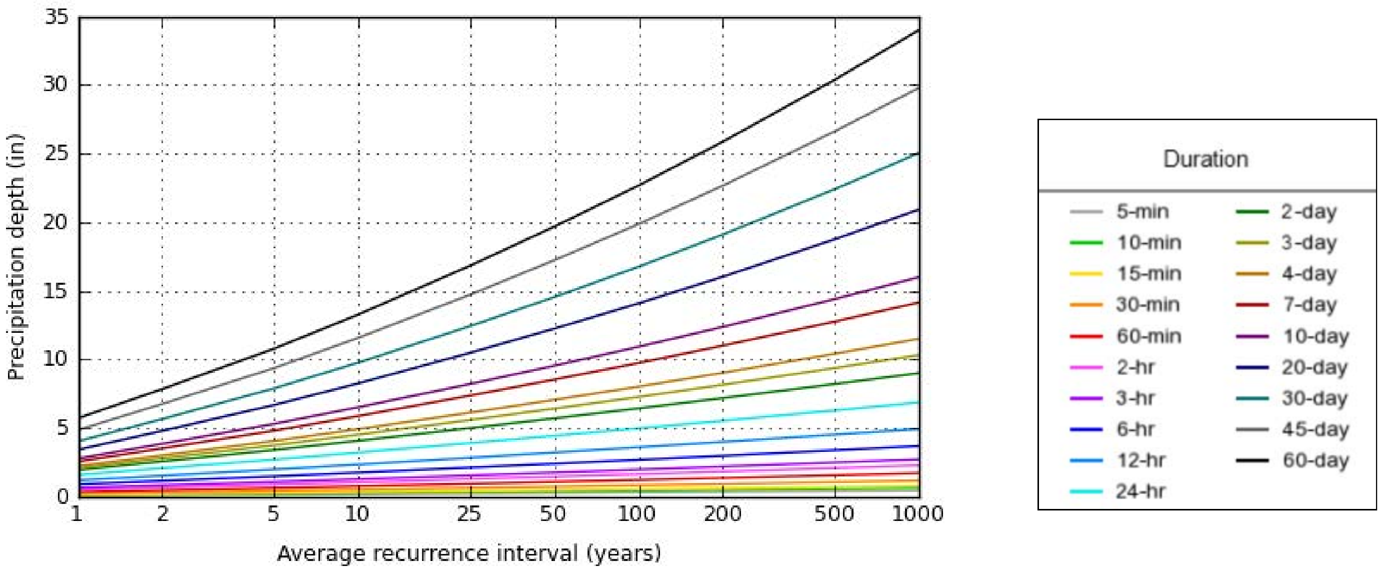
PF graphical





NOAA Atlas 14, Volume 6, Version 2 Created (GMT): Fri Dec 22 21:57:37 2017

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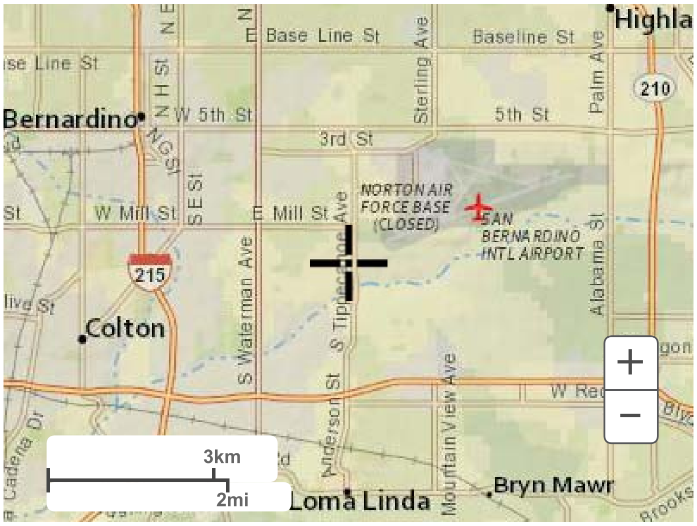
Maps & aerials

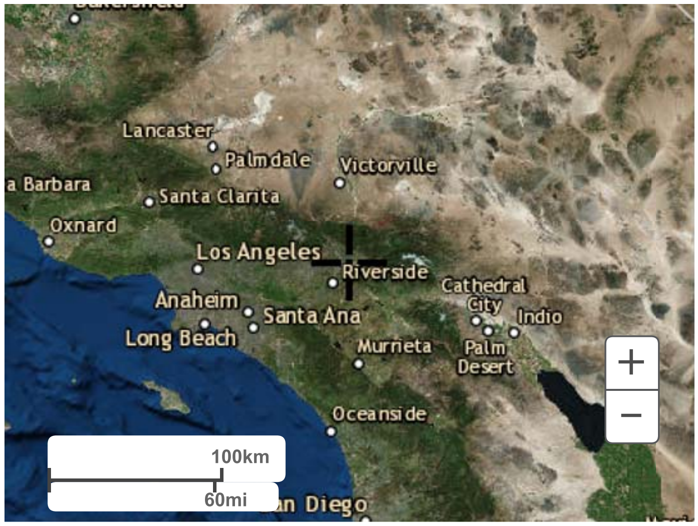
Small scale terrain



Large scale terrain

Large scale map

Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

GEOTECHNICAL ENGINEERING REPORT

Proposed CNG Fuel Station Development
NWC of South Tippecanoe Avenue
and East Central Avenue
San Bernardino, California 92408

Prepared for

Mr. Devin Dancocks
Project Manager
Clean Engergy Fuels
4675 MacArthur Court
Suite 800
Newport Beach, California 92660

Prepared by

Professional Service Industries, Inc.
11980 Telegraph Road, Unit 104
Santa Fe Springs, California 90670

May 5, 2021

PSI Project No. 0066-2055

Douglas T. Abernathy, PE, GE
Senior Project Engineer

REGISTERED PROFESSIONAL ENGINEER
DOUGLAS T. ABERNATHY
GE 2547
Exp. 12/31/22
GEOTECHNICAL
STATE OF CALIFORNIA

Sheng Zong John Ho, PhD, PE, GE
Principal Consultant

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FIGURES

LIST OF APPENDICES

1 PROJECT INFORMATION

1.1 PROJECT AUTHORIZATION

Professional Service Industries, Inc. (PSI) has completed a Geotechnical Investigation for the proposed CNG fuel station development at the site located in San Bernardino, California as referenced above. Our work was performed in general accordance with Work Order Authorization (PO00097882) referencing our proposal 0066-335759 dated March 1, 2021 and authorized signed March 24, 2021.

1.2 PROJECT DESCRIPTION

Currently the site consists of a demolished orchard at the northwest corner of East Central Avenue and South Tippecanoe Avenue in San Bernardino, California. East Central Avenue borders the site to the south, an industrial building borders the site to the west, South Tippecanoe Avenue borders the site to the east, and an existing tractor trailer storage lot borders the site to the north.

Based on the plans provided, we understand that the proposed project will involve the installation of a compressed natural gas vehicle fueling station with proposed equipment pads, storage tanks, compressors, dryers, pump skids, and future equipment. A parking area is also proposed along with utilities, detention basins and a dispenser canopy (25 feet by 36 feet). A tank is also proposed which will be 10 feet in diameter around 50 feet in height. The proposed improvements will typically be supported by equipment pad mat foundations with shallow foundations supporting the storage vessels. Proposed loadings for the 3-tier storage module shallow foundations are anticipated to be around 1,200 pounds per square foot (psf). The tank loading is proposed to be less than 1,000 psf in compression; however, structural loading information in terms of uplift and over-turning was not available at the time this report was written. Compressors, dryers, and miscellaneous equipment are anticipated to provide loadings of less than 200 psf and be supported by mat foundations.

The geotechnical recommendations presented in this report are based on the available project information, site location, laboratory testing, and the subsurface materials encountered. If any of the noted information is incorrect, please inform PSI in writing so that we may amend the recommendations presented in this report if appropriate and if desired by the client. PSI will not be responsible for the implementation of its recommendations when it is not notified of changes to the project.

2 SITE AND SUBSURFACE CONDITIONS

2.1 SITE DESCRIPTION

The project site is currently an unimproved, demolished orchard as described above. A Site Vicinity Map showing the site location is included as Figure 1.

2.2 TOPOGRAPHY

Based on USGS topography mapping of the region (San Bernardino South Quadrangle), the site appears to be generally flat with an elevation of approximately EL 1050 feet above mean sea level. Based on Google Earth, surface elevations range from approximately EL 1060 near the northeast corner to approximately EL 1050 near the southwest corner.

2.3 GEOLOGY

Based on geologic mapping of the area by Dibblee (2004), we anticipate the geology to consist of alluvium deposits (Qa) typically consisting of sand and finer cobbles and gravel. A site approximately one mile north-northwest of the site encountered gravelly sand to depths of 25 feet below ground surface (bgs).

2.4 SUBSURFACE CONDITIONS

Soil borings were drilled to depths of 6½ to 21½ feet beneath the ground surface, the subsurface soils encountered beneath the ground surface (bgs) generally consist of Poorly Graded Sand, Poorly Graded Sand with Silt, and Silty Sand. These sands were generally categorized as very loose to loose, with a few areas being categorized as medium dense to dense. The loose sands appeared to extend to depths ranging from approximately 10 to 18 feet bgs. The soil borings were backfilled with soil cuttings upon completion. The stratification presented on the boring logs is based on interpretation of field logs by a geotechnical professional.

The above subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring logs should be reviewed for specific information at individual boring locations. The stratification shown on the boring logs represents the conditions only at the actual boring locations at the time of our exploration. Variations may occur and should be expected between boring locations. The stratification shown on the logs represents the approximate boundary between subsurface materials and the actual transition may be gradual.

2.5 GROUNDWATER INFORMATION

Based on the California Department of Water Resource database, groundwater is more than 50 feet below the ground surface. More recent measurements show groundwater depths around 90 feet below ground surface (bgs) approximately 3,300 feet west of the site (Well # 340856N1172758W005). Based on mapping by Carson and Matti (1985), historic high groundwater is believed to be below a depth of 70 feet below ground surface. The San Bernardino County Land Use Plan indicates that the site area has a low liquefaction potential. Based on this information and the depths to groundwater, we believe that liquefaction and associated ground movements are required to be evaluated for the site.

2.6 SEISMIC CONSIDERATIONS

Regional Seismicity

The project site is located in Southern California, which has undergone a complex multiphase structural history and remains an active tectonic region with documented historic earthquakes. Generally, the seismicity within California can be attributed to faulting due to regional tectonic movement. This includes the San Andreas Fault and other sub-parallel strike-slip faults, as well as normal and thrust faulting within the State. The area of the subject site is considered seismically active. Seismic hazards within the site can be attributed to potential ground shaking resulting from earthquake events along nearby or more distant faulting.

Faulting Potential

Based on maps published by the California Division of Mines and Geology (1977), no active fault zones are known to cross the site. The San Bernardino County Land Use General Plan for Geologic Hazard Overlays (San Bernardino South, FH30C), indicates that the site is not located within an Alquist-Priolo Fault Zone. Based on the 2010 CGS Fault Activity Map, the project site is located approximately 1 to 2.3 miles from the San Jacinto Fault Zone. Based on this information, no known active (or potentially active) faults traverse the site. However, significant shaking should be expected during a major earthquake.

Seismically-induced Dry Sand Settlement

The San Jacinto Fault Zone is capable of generating major earthquakes with Moment Magnitude (Mw) ranging from 6.5 to 7.5. Reported site acceleration (PGAm) is 0.984g based on OSHPD (2021) Seismic Design Maps. Dry sand settlement was estimated to be on the order of 4 to 7 inches based on Tokimatsu and Seed (1987), generally occurring in the top 10 to 18 feet; below which dense and very dense sands were encountered. These estimated dry sand settlements exceed the generally accepted allowable range for shallow foundations. Recommendations regarding ground improvement is provided in Section 3 Conclusions and Recommendations of this report.

Liquefaction Potential

The site is located within an area designated by the San Bernardino County Land Use General Plan of Geologic Hazard Overlays as having a low potentially for liquefaction. Based on the historic high depth of 70 feet to groundwater, we believe that liquefaction potential is not a design concern. In addition, the proposed structures are not considered to be habitable. Therefore, a liquefaction evaluation of the site was not performed.

Lateral Spread Potential

Lateral spreading is believed to be negligible due to the lack of liquefaction potential at the site.

Tsunamis and Seiches

Based on the elevation of the site, tsunamis (seismic or "tidal waves") will not occur. Based on there being no confined bodies of water near the site, the site is also not considered subject to seiches.

Seismic Design Considerations

We have employed the 2019 California Building Code (CBC), the locally adopted version of the International Building Code, 2018 edition. As part of this code, the design of structures must consider dynamic forces resulting from seismic events. These forces are dependent upon the magnitude of the earthquake event as well as the properties of the soils that underlie the site.

As part of the procedure to evaluate seismic forces, the code requires the evaluation of the Seismic Site Class, which categorizes the site based upon the characteristics of the subsurface profile within the upper 100 feet of the ground surface. Our boring extended to a depth of 21½ feet bgs, but to define the Site Class for this project, we have interpreted the results of soil test borings drilled within the project site and estimated appropriate soil properties below the base of the borings to a depth of 100 feet as permitted by the code. The estimated soil properties were based upon the soils encountered at the site, data available in published geologic reports, and our experience with subsurface conditions in the general site area.

Based upon our evaluation, the subsurface conditions at the site are consistent with the characteristics of a **Site Class "D"** as defined in Chapter 20.3-1 of the ASCE 7-16. The associated probabilistic ground acceleration values and site coefficients for the general site area were obtained from the USGS geohazards web page (https://seismicmaps.org/) using NEHRP 2015 and are presented in the table below.

Table 1 - Ground Motion Values*

Period (sec)	Mapped MCE Spectral Response Acceleration (g)		Site Coefficients		Adjusted MCE_R Spectral Response Acceleration (g)		Design Spectral Response Acceleration (g)	
0.2	S_s	2.12	F_a	1	S_{Ms}	2.12	S_{Ds}	1.413
1.0	S_1	0.843	F_v	See 11.4.8	S_{M1}	See 11.4.8	S_{D1}	See 11.4.8

**2% Probability of Exceedance in 50 years* — *Latitude* 34.0862°N
MCE_R = Maximum Considered Earthquake — *Longitude* 117.2621°W

The Site Coefficients referring on ASCE 7-16 Section 11.4.8 require the structural engineer to apply appropriate calculations as needed. Design of structures should comply with the requirements of the governing justification's building codes and standard practices of the Structural Engineering Association of California.

2.7 INFILTRATION TESTING

PSI performed five (5) percolation tests in the central portion of the property near boring locations B8 and B9 as shown on Figure 2. Testing was performed to determine the infiltration rate at each location in general accordance with the Riverside County Low Impact Development BMP Design Handbook (9/11) as referenced in the San Bernardino County Technical Guidance Document for WQMP (effective 9/19/2013) and the Orange County TGD (dated 5/19/11). Test depths were provided by you. At the test depths of 5 feet bgs, subsurface materials consisted of loose sand and silty sand. Boring logs are attached as well as laboratory test results.

Infiltration test boreholes of approximately 8 inches in diameter were extended to the test depths. Tests P1 through P5 consisted of installing 4-inch diameter PVC pipes above a 2-inch granular layer placed at the bottom of each test hole. Gravel was then placed in the annulus surrounding the PVC. Presoaking with 5 gallons of water was performed twice to determine intervals of testing. Final calculations to determine the infiltration rate incorporated the Porchet Method for determining a reasonable estimate of infiltration rates. The Porchet formula is provided below. Percolation test results are attached in Appendix B.

$$\text{Infiltration Rate } (I_t) = \frac{\Delta H(60r)}{\Delta t(r+2H_{avg})}$$

When: r = Test hole radius (inches)
ΔH = Change in head height over time interval (inches)
Δt = Time interval (minutes)
H_{avg} = Average head height over time interval (inches)

Measured infiltration rates are provided below. Appropriate factors of safety should be used as required by the guidance document.

Table 2 – Infiltration Test Results

Infiltration Test Location	Average Head During Test (in)	Unfactored Field Measured Infiltration (in/hr)
P1	12	46.2
P2	14.7	13.4
P3	12	24.8
P4	12	29.7
P5	12	32.5

Infiltration rates vary depending on locations, depths, and water head applied. For design, time to empty estimates should include an additional factor of safety of at least 2.

3 CONCLUSIONS AND RECOMMENDATIONS

The following geotechnical related recommendations have been developed on the basis of the subsurface conditions encountered and PSI's understanding of the proposed development. Should changes in the project criteria occur, a review must be made by PSI to determine if modifications to our recommendations will be required. Primary geotechnical concerns include soil collapse and seismically-induced dry sand settlements on the order of 4 to 7 inches within the very loose to loose sandy soils encountered to depths ranging from 10 to 18 feet bgs. In order to mitigate these potentials, PSI recommends that ground improvement be implemented. Feasible technologies for mitigation may include either Rapid Impact Compaction or Densified Aggregate Piers. PSI recommends that a ground improvement specialty contractor be retained to design their system(s) to meet project requirements. Alternatively, if over-excavation is performed to a depth of at least 5 feet (and 5 feet beyond the structure), settlements of up to 4 inches should be incorporated into design.

3.1 SITE PREPARATION AND GROUND IMPROVEMENT

The site development area should be cleared of all foundations, undocumented fill, utilities, surface vegetation, or other improvements in conflict with the new construction. All materials resulting from demolition of the existing improvements should be legally disposed off-site.

Following site clearing, the proposed structural development area should be improved. Rapid Impact Compaction (RIC) or Densified Aggregate Piers (DAP) can be implemented to mitigate potential seismic concerns. PSI should review ground improvement design and be retained for full-time observation during ground improvement operations. Ground improvement limits should extend at least 5 feet beyond the proposed building limits.

3.1.1 Rapid Impact Compaction

The RIC treatment should be designed and performed by an experienced geotechnical specialty contractor using a track-mounted RIC machine that imparts energy by dropping an approximately 7.5-ton weight 36 inches hitting a 5-foot-diameter steel foot at a maximum spacing of 5 feet on center. The weight is dropped at a rate ranging 40 to 60 blows per minute. The drop height, number of blows, and penetration per blow are monitored and controlled by an on-board data acquisition system and manually recorded.

Compaction at each point is considered completed using the following criteria: 1) tamping a maximum of 40 blows, 2) a compaction footprint (dimple) depth greater than 2.5 feet, or 3) a refusal set (penetration per blow) depth less than 0.2 inches per blow. If the dimples are deeper than 18 inches, the area will be re-graded and a second pass is generally performed.

The post-RIC subgrade should be proof-rolled with a heavy rubber-tired piece of construction equipment (15 tons or similar, if possible) in the presence of the Geotechnical Engineer's representative. Areas that deflect more than 1 inch during proof-roll should be moisture-conditioned and compacted prior to placing Engineered Fill for structures (refer to Section 3.5 Engineered Fill).

3.1.2 Densified Aggregate Piers

DAPs are generally designed and constructed by a geotechnical specialty contractor. DAPs are typically constructed by drilling a 24- to 30-inch-diameter borehole and fill the cavity with compacted aggregate. The aggregate generally consists of clean, open-graded crushed rock near the water table and Class 2 aggregate base above the water table. The aggregate is compacted in approximately 12-inch-thick lifts using a modified hydraulic hammer mounted on an excavator. Due to the potential for vibrations and equipment reach, DAPs constructed using the open-hole method are generally installed no deeper than 10-15 feet below ground surface; and not more than 1-2 feet below groundwater to minimize cave-in or sloughing. Large, angular stones may be used to stabilize the bottom of boreholes as needed. In areas where shallow groundwater is anticipated and open-hole method is not feasible, mandrels are often used to install aggregate piers to a deeper depth, typically range from 25 to 35 feet or more below ground surface.

DAPs develop vertical support through a combination of frictional resistance along the shaft of the pier and improvement of the surrounding soil matrix, allowing use of higher bearing capacities than feasible in unimproved soil. DAPs can also be designed to resist transient uplift loads by installing steel rods or steel harness in the pier; the rods are attached to a flat steel plate at the base of the of the footings. Depending on the magnitude of design uplift and shear loads, it may be feasible to use uplift DAPs to support the proposed 10-foot-diameter x 50-foot-high tank.

Lateral loads are resisted through a combination of passive pressure on the face of the footings and friction along the base of the footings. The frictional resistance is larger for a DAP-supported footing than for a footing supported on unimproved ground because of the presence of the compacted aggregate. The required size, spacing, length, and strength of piers should be determined by the specialty contractor, based on the desired level of improvement. For preliminary planning purposes, 24 to 30-inch diameter DAP installed to a depth of approximately 15 feet below the bottom of footings can reduce total (static + seismic) settlement to approximately 1 inch, and a differential settlement of approximately ½-inch.

3.1.3 Over-Excavation

If over-excavation is preferred instead of the RIC or DAP options above, over-excavations should extend to depths of at least 5 feet and at least 5 feet laterally beyond the structure. Subgrade soils should be scarified, moisture conditioned, and compacted prior to filling above. Seismically-induced dry sand settlements of up to 4 inches should be incorporated into the design. Flexible utility connections should be provided in this scenario.

3.2 GENERAL GRADING

Proposed cuts and fills of up to $\pm$1 foot may be anticipated within the project site to establish design grades. Once excavations are performed as needed, proof-rolling should be performed using a heavy rubber-tired piece of construction equipment (15 tons or similar, if possible) in the presence of the Geotechnical Engineer's representative to confirm firm and unyielding subgrades prior to fill being placed above. Final grading should be designed to provide positive drainage away from the proposed structures.

Soil areas within 10 feet of the proposed structures should slope at a minimum of 5 percent away from the structure, if possible. Roof leaders and downspouts (if any) should discharge onto paved surfaces sloping away from the structure or into a closed pipe system which outfalls to the street or directly to the storm drain system.

If grading occurs in the winter rainy season, unstable subgrade conditions may be present. These conditions may require stabilizing the subgrade by adding coarse aggregate or admixtures such as cement kiln dust. Isolated areas may be stabilized using a geogrid, such as Tensar BX-1200 or equal, with one foot compacted Class II aggregate base over the geogrid. If such situations are encountered during construction, this office should be contacted for further recommendations.

3.3 EXCAVATION CONSIDERATIONS

Open excavations exceeding four feet should be performed in accordance with OSHA regulations as stated in 29 CFR Part 1926. The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. Dry temporary slopes must not exceed 1 horizontal to 1 vertical (1H:1V) or excavate below such soils supporting adjacent structures. The contractor should evaluate the soil exposed in the excavations as part of the required safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified by local, state, and federal safety regulations. PSI is providing this information solely as a service to our client. PSI does not assume responsibility for construction site safety or the contractor's or other parties' compliance with local, state, and federal safety or other regulations.

During wet weather, earthen berms or other methods should be used to prevent runoff water from entering the excavations. The bottom of the excavations should be sloped to a collection point. Collected water within the foundation and utility trench excavations should be discharged to a suitable location outside the construction limits.

3.4 Utility Trench Construction

Utility trenches can be backfilled with suitable on-site native soils or imported soil above the utility line and bedding and shading materials. Trench backfill should be moisture conditioned to within +2 percent of the optimum moisture content (if granular), compacted in 4- to 6-inch lifts to a minimum of 90 percent of the maximum dry density as determined by the modified Proctor (ASTM D1557). If utility trenches are within pavement areas, the upper 12 inches of pavement subgrade should be compacted to 95 percent of modified proctor. If rocks larger than 3 inches in maximum size are encountered, they should be removed from the fill material prior to placement in the utility trenches. Utility bedding and trench backfill material compaction requirements should be in conformance with the requirements of the local agencies having jurisdiction, but typically require clean granular material having a sand equivalent equal to or above 30. Jetting or flooding of utility backfill is not recommended.

3.5 ENGINEERED FILL

Engineered fill may include both on-site (native and fill) and import soil, should not contain rock fragments greater than 3 inches in diameter or have greater than 30 percent retained on the ¾-inch sieve, and should not contain more than 3 percent (by weight) of organic matter or other unsuitable material. On-site or Imported Engineered Fill soils should have an Expansion Index (EI) that does not exceed 20. Based on our subsurface investigation, existing on-site soils are generally suitable for use as Engineered Fill. The suitability of onsite materials for use as engineered fill should be confirmed by a PSI representative during grading. Import materials meeting the above requirements should be approved by the Geotechnical

Engineer several days prior to importing to the site. Soils that are environmentally impacted should not be used as Engineered Fill onsite.

Engineered Fill and the subgrade prior to receiving fill should generally be compacted to at least 90 percent of the maximum dry density as determined by the modified Proctor (ASTM D1557); top 12 inches of soil subgrade below pavement sections should be compacted to at least 95%.

The moisture content of Engineered Fill should be maintained at $\pm$2 percent of the material's optimum moisture content (if granular). If the Engineered Fill is too dry, water should be uniformly applied across the affected fill area. If the Engineered Fill is too wet, it must be dried. Engineered Fill should be thoroughly mixed by disking, or other approved methods, to obtain relatively uniform moisture content throughout the lift immediately prior to compaction.

Engineered Fill should be placed in maximum lifts of 9 inches of loose material. Each lift of Engineered Fill should be tested by a PSI soils technician, working under the direction of our Project Geotechnical Engineer, prior to placement of subsequent lifts. If smaller compaction equipment such as jumping jacks or plate compactors are used thinner lifts will be required to achieve compaction.

Compaction of all backfill should be verified with a sufficient number of density tests, as determined by the Geotechnical Engineer, to determine if adequate compaction is being achieved by the contractor. The properly compacted Engineered Fill should extend horizontally outward beyond the exterior perimeter of the structure a distance equal to the height of newly placed fill or 3 feet, whichever is greater, prior to significant sloping.

3.6 SHALLOW FOUNDATIONS

Based on the recommended site preparation, it is our opinion that the proposed building foundations may be supported by conventional shallow foundations underlain by approved native soils or Engineered Fill. Footings supported in such soils may be dimension based on an allowable soil bearing pressure of 2,500 psf; footings supported on DAP or founded on RIC-treated ground can be designed for an allowable soil bearing pressure of 3,000 psf.

This recommended allowable soil bearing pressure may be increased by ⅓ for temporary seismic or wind loading. All proposed footings should be embedded a minimum depth of at least 24 inches below the lowest adjacent grade with a minimum width of 24 inches. For resistance to lateral loads, a passive resistance equal to an equivalent fluid weighing 250 pounds per cubic foot (pcf) up to a maximum of 2,500 psf acting against the foundation and a coefficient of friction of 0.33 may be used. The top foot of passive resistance at foundations should be neglected unless the ground surface around the footing is covered by concrete or asphalt pavement.

It is recommended that the foundation bearing grade be evaluated by the Geotechnical Engineer during construction, prior to steel or concrete placement, to assess the suitability of the exposed soils.

Following approval, the rebar and concrete should be placed as quickly as possible to avoid exposure of the excavated surface to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. The foundation rebar and concrete should be placed during the same day the excavation is made, if possible. If it is required that footing excavations be left open for more than one day, they should be protected to minimize weathering. Cracked or damaged footing excavation edges should be discarded or replaced.

3.7 MAT FOUNDATIONS

The proposed new addition may also be supported on a mat foundation placed on approved native soil or compacted fill provided the subgrade has been prepared as described above. Soft or otherwise unsuitable areas observed should be addressed on a case-by-case basis by our Geotechnical Engineer. Mat foundation and structural slab can be designed in combination with ground improvement as needed. For subgrade prepared as recommended above, an allowable modulus of subgrade reaction (k) of 200 pounds per cubic inch (pci) may be used when embedded a minimum of 6 inches below grade. This design recommendation is based on values typically obtained from 1-foot by 1-foot plate load tests. However, depending on how the mat load is applied, the value will have to be geometrically modified and adjusted for larger areas. If desired, the mat may be designed using an allowable soil bearing pressure of 1,500 psf.

For resistance to lateral loads, an allowable coefficient of friction of 0.33 between the base of the foundation elements and underlying material is recommended. In addition, a passive resistance equal to an allowable equivalent fluid weighing 250 pounds per cubic foot (pcf) acting against the foundation may be used to resist lateral forces. The top foot of passive resistance should be neglected unless the ground surface immediately surrounding the foundation is covered by concrete or pavement.

The structural engineer shall detail these elements as needed. PSI recommends that the foundation excavations be observed and documented by PSI's Geotechnical Engineer or designated technical representative prior to placement of structural fill, concrete, or reinforcing steel to verify their suitability for foundation support.

3.8 CANOPY PIER FOUNDATIONS

Although it is feasible to install drilled piers for support of the proposed canopy; cave-ins and sloughing should be expected at this project site considering the very loose to loose sands. Casing should be made available on-site to prevent cave-ins and sloughing. Relatively large shallow foundations may be more effective from a construction standpoint.

Drilled piers are to be utilized for canopy foundation elements. We recommend that these piers consist of an augured shaft having typical diameters of approximately 24 to 36 inches in diameter. The drilled piers are drilled to a design depth and filled with reinforced concrete. Design parameters related to drilled pier foundations have been prepared based on the field explorations, testing of the selected samples in the laboratory, published references, and engineering judgment.

Piers installed in accordance with the recommendations stated above are estimated to provide an allowable capacity as shown in the table below. Canopy piers should be a minimum of 10 feet deep. Pier capacity estimations were made incorporating a factor of safety of 3 for end bearing capacity and 2 for skin friction. Allowable uplift capacity of the piers can be assumed to be one-half of the axial skin friction values provided below. End-bearing should be ignored unless the bottom of pier is cleared of loose materials using a clean-out bucket.

Table 3 - Design Values for Drilled Piers

Layer	Soil Type	Depth Range (feet) bgs	Allowable Downward Skin Friction (ksf)	Allowable Bearing Capacity (ksf)
1	Sand	0 – 10	0	0
2	Sand	10 – 15	0.14	6.9
3	Sand	15 - 20	0.24	10.3

bgs = below ground surface

Lateral resistance for the drilled piers should be designed using an allowable passive pressure of 250 psf/ft for static conditions with a maximum allowable pressure of 2,500 psf. Passive pressure can be doubled where a pier deflection of ½ inch at the ground surface is structurally acceptable. For passive resistance, an equivalent width of two times the drilled pier diameter may be used in design. For temporary wind and seismic conditions, capacities may be increased by x1.33.

PSI recommends that the drilling contractor review the field exploration logs of this report before starting excavations for the drilled piers. Although perched groundwater is not anticipated; cave-in and sloughing soils are anticipated to be encountered in the very loose to loose, dry sands.

PSI should be retained to observe and document complete drilled pier construction (start to finish) and to evaluate whether the subsurface and pier bearing conditions are as anticipated in this report. When the drilling processes are completed (inspected and approved by PSI) for the drilled piers, the reinforcing steel and the concrete should be placed immediately after the final cleanout pass is conducted on the base. The tremie method of concrete placement should be adopted when placing concrete below groundwater (not likely) to prevent segregation of the concrete materials. If concrete is placed by the free-fall method into a dry excavation, it should be placed to avoid contact with the excavation sidewalls to prevent segregation and should be limited to a drop height of 4 feet. Due to the presence of very loose to loose, dry sands, the use of temporary casing is expected to be necessary to prevent caving. Temporary casing must be removed during concrete placement keeping a concrete head of at least 2 feet above the bottom of the casing as it is being withdrawn.

Concrete placed in the pier excavations should have a slump in the range of 7 to 9 inches to reduce the potential for the formation of voids as the temporary pier casing is extracted (if used) and around rebar. The concrete mix should be designed to attain the required 28-day design strength when placed at this slump. Pier designs should be reviewed by the Geotechnical Engineer prior to submittal.

We estimate that pier foundations will experience less than ½ inch of immediate, post-construction static settlement within the soils encountered, with less than ¼ inch of differential static settlement between piers with a lateral surface distance of 40 feet apart from each other.

3.9 SETTLEMENT

We estimate that foundations designed and constructed in accordance with the recommendations, including ground improvement, herein will experience post-construction total static settlements generally less than 1-inch with differential static settlement of less than ½-inch along a 40-foot section of foundation. Total and differential settlements of these magnitudes are usually considered tolerable for the anticipated construction. However, the tolerance of the proposed structure to the predicted total and differential settlements should be confirmed by the structural engineer.

3.10 PAVEMENT DESIGN

If new pavements are proposed, the following conditions were considered in our design:

1. Subgrade support characteristics are typically represented by an R-Value for the design of flexible pavements in this region.
2. Vehicular traffic volumes, in terms of the number and frequency of vehicles and their range of axle loads was considered.
3. Likely changes in vehicular use over the life of the pavement was considered. We have assumed that the pavement areas will not experience additional traffic.
4. Pavement life cycle was considered to be 20 years.

All site preparations and grading should be performed as discussed above in Section 3.2.

Since an evaluation of the characteristics of the actual soils present at pavement subgrade can only be provided at the completion of grading, the following pavement sections should be used for planning purposes only. Final pavement designs should be evaluated after R-value tests have been performed on the actual in-place subgrade materials exposed for use during construction.

It should be noted that additional earthwork and/or ground improvement efforts may be required during grading on the actual subgrade material encountered, in order to achieve the aforementioned design parameters and assumptions. These design thicknesses assume that a properly prepared subgrade has been achieved.

Based on the results of our field exploration and laboratory testing, the following preliminary pavement design recommendations are provided. The preliminary pavement design criteria are based on the soil conditions present at the site, an R-value of 40 and the assumed Traffic Index indicated below based on the estimated traffic for the site.

Table 4 - Pavement Section Recommendations

Location	**Traffic Index** (TI)	**Asphalt Thickness** (inches)	+	**Aggregate Base Thickness** (inches)	**Portland Cement Concrete Thickness** (inches)	+	**Aggregate Base Thickness** (inches)
Standard Drive Aisles	5	3	+	4	-		-
Truck Drive Aisles	7	3½	+	8	5½	+	4

We recommend rigid pavements (Portland Cement Concrete, PCC) be constructed at all areas requiring heavy braking and turning such as entrances, refueling areas, trash truck loading areas, etc. PCC pavement sections should incorporate appropriate steel reinforcement and crack control joints as designed by the project structural engineer. We recommend that sections be as nearly squared as possible and no more than 15-feet on a side. Construction joints used to control shrinkage cracking may be constructed by saw cutting to a depth of ¼ of the slab thickness. Expansion/cold joints may be used in lieu of construction joints. Such joints should be properly sealed. A minimum 4,000 psi mix is recommended having a water/cement ratio of 0.5 or less.

Prior to placement of aggregate base (or asphalt), the upper 12 inches of subgrade should be proof-rolled, scarified to a depth of 12 inches, brought to moisture contents at $\pm$2 percent of optimum moisture content, then compacted to at least 95 percent of the laboratory standard. The laboratory standard should be ASTM D1557.

Aggregate base below pavement sections should also be compacted to at least 95 percent of ASTM D1557 with moisture contents within $\pm$2 percent of optimum. Aggregate base materials should be Caltrans Class II Crushed Aggregate Base.

All materials should conform to and be placed in accordance with the latest revision of the Standard Specifications for Public Works Construction (Greenbook), the American Concrete Institute (ACI), and the Portland Cement Association (PCA).

3.11 CONSTRUCTION CONSIDERATIONS

The near-surface site soils consist of sand and silty sand which are typically not sensitive to disturbances caused by construction traffic. During wet weather periods, increases in the moisture content and disturbance of the soil can cause significant reduction in the soil strength and support capabilities. Furthermore, perched groundwater conditions can develop during periods of heavy rainfall as a result of less permeable layers impeding infiltration. In these instances, subgrade soils may become unstable and require remedial measures. It will, therefore, be advantageous to perform earthwork and foundation construction activities during dry weather.

3.12 PLAN REVIEW

Once ground improvement, final civil, and structural plans are available, a review by PSI is recommended prior to submittal as a means to check that our geotechnical recommendations have been properly interpreted and implemented. Reviewing agencies should require our review. Our signing and stamping of any plans require our prior review and approval. Associated drawing edits may be required. Review of the plan, responses to review comments by others, and work beyond this report will require additional budget.

3.13 OBSERVATION AND TESTING DURING CONSTRUCTION

It is recommended that PSI be retained to provide observation and testing services during site preparation, site grading, utility trench construction, foundation excavation, and subgrade preparation. This is to observe compliance with the design concepts, specifications and recommendations, and to allow for possible changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

If a firm other than PSI is retained for these services during construction, then that firm must notify the owner, project designers, governmental building officials, and PSI that the firm has assumed the responsibility for all phases (i.e., both design and construction) of the project within the purview of the Geotechnical Engineer. Notification must indicate that the firm has reviewed this report and any subsequent addenda, and that it either agrees with PSI’s conclusions and recommendations, or that it will provide independent recommendations.

4 GEOTECHNICAL RISK AND REPORT LIMITATIONS

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. The analytical tools which geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned. The engineering recommendations presented in the preceding sections constitute PSI's professional estimate of those measures that are necessary for the proposed structure to perform according to the proposed design based on the information generated and referenced during this evaluation, and PSI's experience in working with these conditions.

The recommendations submitted are based on the available subsurface information obtained by PSI, and information provided by **Clean Energy**. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the foundation and/or other recommendations are required. If PSI is not retained to perform these functions, PSI cannot be responsible for the impact of those conditions on the performance of the project.

This report has been prepared for the exclusive use of **Clean Energy**, Inc. for the specific application as described herein.

5 REFERENCES

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4. Dibblee, T.W., "Geologic Map of the San Bernardino North / North ½ of San Bernardino South Quadrangles", 2004.
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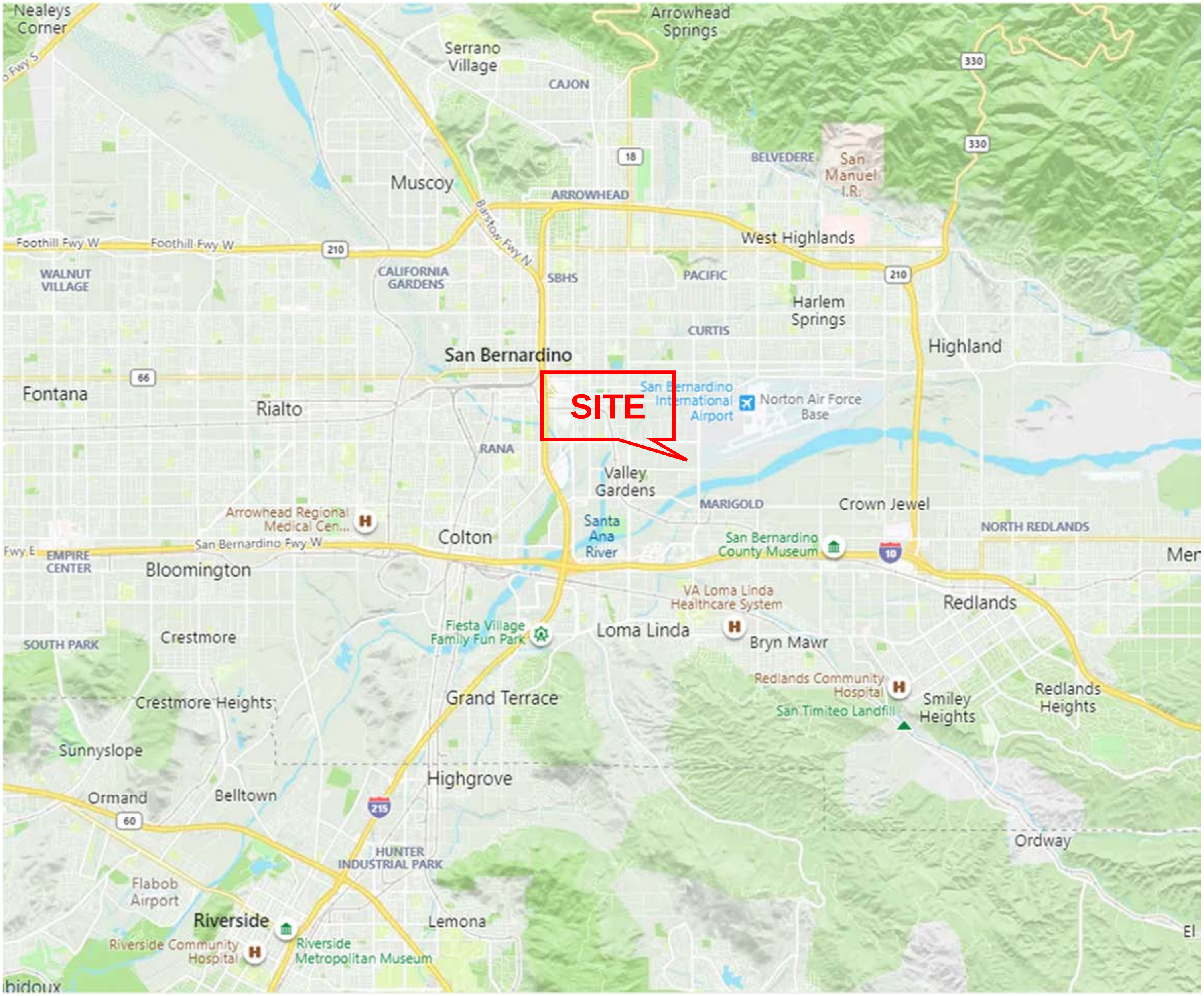
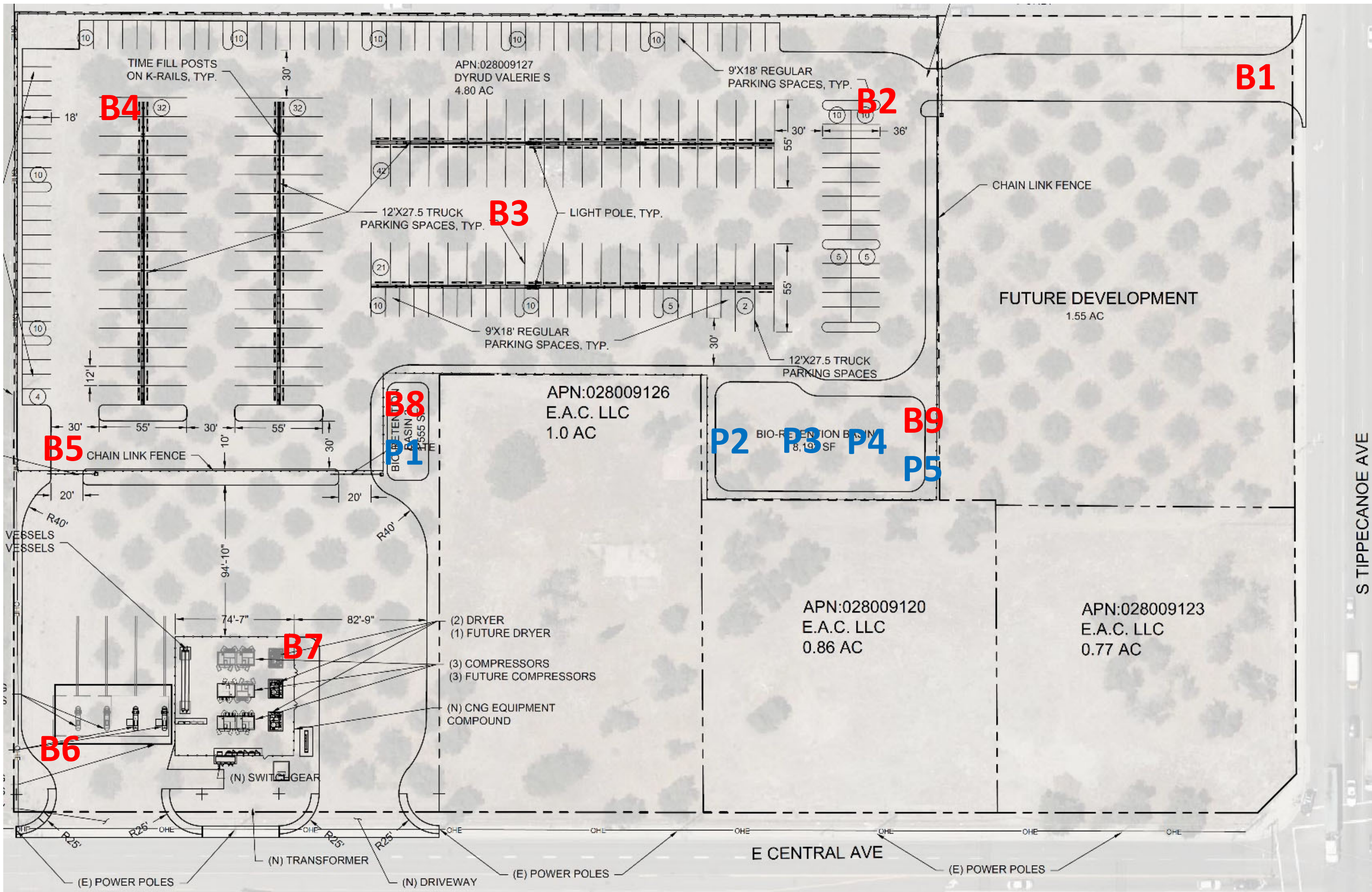
8. USGS, "San Bernardino South Quadrangle, California, 7.5-Minute Series", 2018.
9. USGS Website https://seismicmaps.org/, US Seismic Design Maps.

FIGURES



Reference – Bing Maps

intertek psi	DATE: 5/5/2021	**Proposed CNG Fuel Station Development** NWC Tippecanoe Ave and Central Ave San Bernardino, CA 92408	PSI PROJECT NUMBER: 0066-2055	N
INTERTEK - PSI, INC. 11980 TELEGRAPH RD, UNIT 104 SANTA FE SPRINGS, CALIFORNIA	PREPARED BY: DTA	**SITE VICINITY MAP**	**FIGURE 1**	



Legend

⨁ **B9** **Approximate Boring Location**

P5 **Percolation Test**

Reference:
Clean Energy C1.0
4/1/21

intertek psi	DATE: 5/5/2021	**Proposed CNG Fuel Station Development** NWC Tippecanoe Ave and Central Ave San Bernardino, CA 92408	PSI PROJECT NUMBER: 0066-2055	N
INTERTEK - PSI, INC. 11980 TELEGRAPH RD, UNIT 104 SANTA FE SPRINGS, CALIFORNIA	PREPARED BY: DTA	**APPROXIMATE BORING AND TEST LOCATIONS**	**FIGURE 2**	

APPENDIX A

FIELD EXPLORATIONS AND LABORATORY TESTING PROGRAM

FIELD EXPLORATION PROGRAM

On April 15, 2021, the subsurface conditions were explored by drilling nine (9) soil borings (B1-B9) in the proposed canopy, equipment pad, parking lot, and drainage basin areas to maximum depths of approximately 6½ to 21½ feet below ground surface (bgs). The boring locations are shown on Figure 2. Drilling was performed by 2R Drilling of Chino, California using a hollow-stem auger method of drilling. The soil types encountered at the specific boring locations are presented on the attached Boring Logs.

During the boring sampling procedure, Standard Penetration Tests (SPT) were performed in accordance with ASTM D1586 and relatively undisturbed samples were obtained in general accordance with ASTM D3550. The SPT for soil borings is performed by driving a split-spoon sampler, with an outside diameter of 2 inches, into the undisturbed formation located at the bottom of the advanced borehole with repeated blows of a 140-pound hammer falling a vertical distance of 30 inches. The number of blows required to drive the sampler the last 12 inches of an 18-inch penetration depth is a measure of the soil consistency (blow count). For ASTM D3550 (California Modified Sampler) the split barrel sampler possesses a 3-inch O.D. and is driven in the same manner as the SPT. The field blow counts obtained from the California Modified sampler should be adjusted to obtain a rough correlation to SPT blow counts (SPT-N value). SPT blowcounts in gravel tend to over-estimate density. Samples were identified in the field, placed in sealed containers and transported to the laboratory for further classification and testing.

Field Classification

Soil samples were initially classified visually in the field. Consistency, color, relative moisture, degree of plasticity, and other distinguishing characteristics of the soil samples were noted. The terminology used in the soil classifications and other modifiers are depicted in the General Notes and Soil Classification Chart.

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.
HSA: Hollow Stem Auger - typically 3¼" or 4¼ I.D. openings, except where noted.
M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
R.C.: Diamond Bit Core Sampler
H.A.: Hand Auger
P.A.: Power Auger - Handheld motorized auger

SPT: Standard Penetration Test sampler - 1 3/8" I.D., 2" O.D.
CMS: California Modified Sampler - 2 1/2" I.D., 3" O.D.
ST: Shelby Tube - 3" O.D.
RC: Rock Core
BS: Bulk Sample

SOIL PROPERTY SYMBOLS

N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
N_{60}: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
Q_u: Unconfined compressive strength, TSF
Q_p: Pocket penetrometer value, unconfined compressive strength, TSF
w%: Moisture/water content, %
LL: Liquid Limit, %
PL: Plastic Limit, %
PI: Plasticity Index = (LL-PL),%
DD: Dry unit weight, pcf
▼,▽,▼: Apparent groundwater level at time noted

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50+

ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (¾ in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to ¾ in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.005 mm to 0.075 mm
Clay:	<0.005 mm

PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%

GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

Q_U - TSF	N - Blows/foot	Consistency
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

MOISTURE CONDITION DESCRIPTION

Description	Criteria
Dry:	Absence of moisture, dusty, dry to the touch
Moist:	Damp but no visible water
Wet:	Visible free water, usually soil is below water table

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term	% Dry Weight
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

STRUCTURE DESCRIPTION

Description	Criteria
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided:	Fracture planes appear polished or glossy, sometimes striated

Description	Criteria
Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed:	Inclusion of small pockets of different soils
Layer:	Inclusion greater than 3 inches thick (75 mm)
Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
Parting:	Inclusion less than 1/8-inch (3 mm) thick

SCALE OF RELATIVE ROCK HARDNESS

Q_U - TSF	Consistency
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

ROCK BEDDING THICKNESSES

Description	Criteria
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

ROCK VOIDS

Voids	Void Diameter
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

Component	Size Range
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

ROCK QUALITY DESCRIPTION

Rock Mass Description	RQD Value
Excellent	90 -100
Good	75 - 90
Fair	50 - 75
Poor	25 -50
Very Poor	Less than 25

DEGREE OF WEATHERING

Slightly Weathered:	Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.
Weathered:	Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.
Highly Weathered:	Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

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BORING B1

DATE STARTED:	4/15/21	**DRILL COMPANY:**	2R Drilling
DATE COMPLETED:	4/15/21	**DRILLER:** Juan	**LOGGED BY:** Justin
COMPLETION DEPTH	6.5 ft	**DRILL RIG:**	CME-75 Track
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	SS+SPT+CalMod
LATITUDE:	34.087239°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-117.260055°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	DTA
REMARKS:			

Water: NONE

BORING LOCATION: NEC

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture PL LL 0 25 50 STRENGTH, tsf ▲ Qu ✳ Qp 0 2.0 4.0	Additional Remarks
	0					**Poorly Graded SAND with Silt**, light brown, trace gravel, moist, loose.					
								2-3-3 N=6	2		8.2%<#200
						No Gravel.	SP-SM	4-4-4 N=8	6		DD = 102 pcf
	5							2-3-4 N=7	5		
						Boring Terminated at 6-1/2 ft. No groundwater encountered, soil cuttings used as backfill.					

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Professional Service Industries, Inc.
11980 Telegraph Rd, Unit 104
Santa Fe Springs, CA 90670
Telephone: (714) 484-8600

PROJECT NO.: 00662055
PROJECT: Clean Energy Fuel Station
LOCATION: NWC Central Ave, and Tippecanoe Ave
San Bernardino, CA

The stratification lines represent approximate boundaries. The transition may be gradual.

DATE STARTED:	4/15/21	**DRILL COMPANY:**	2R Drilling		
DATE COMPLETED:	4/15/21	**DRILLER:**	Juan	**LOGGED BY:**	Justin
COMPLETION DEPTH	6.5 ft	**DRILL RIG:**	CME-75 Track		
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger		
ELEVATION:	N/A	**SAMPLING METHOD:**	SS+SPT+CalMod		
LATITUDE:	34.087254°	**HAMMER TYPE:**	Automatic		
LONGITUDE:	-117.260871°	**EFFICIENCY**	N/A		
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	DTA		
REMARKS:					

BORING B2

Water NONE

BORING LOCATION:
Center North East

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA: N in blows/ft ◎; × Moisture; PL; LL (0 – 25 – 50); STRENGTH, tsf: ▲ Qu; ✳ Qp (0 – 2.0 – 4.0)	Additional Remarks
	0					**Poorly Graded SAND**, light brown, trace silt, moist, loose to medium dense.	SP				
								4-4-5 N=9	4		DD = 105 pcf
						Color change to Brown.		2-2-3 N=5	6		
	5					Trace Gravel		7-7-10 N=17	6		DD = 110 pcf
						Boring Terminated at 6-1/2 ft. No groundwater encountered. Soil cuttings used as backfill.					

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Telephone: (714) 484-8600

PROJECT NO.: 00662055
PROJECT: Clean Energy Fuel Station
LOCATION: NWC Central Ave, and Tippecanoe Ave
San Bernardino, CA

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B3

DATE STARTED: 4/15/21	**DRILL COMPANY:** 2R Drilling		
DATE COMPLETED: 4/15/21	**DRILLER:** Juan	**LOGGED BY:** Justin	
COMPLETION DEPTH 6.5 ft	**DRILL RIG:** CME-75 Track		
BENCHMARK: N/A	**DRILLING METHOD:** Hollow Stem Auger		
ELEVATION: N/A	**SAMPLING METHOD:** SS+SPT+CalMod		
LATITUDE: 34.087072°	**HAMMER TYPE:** Automatic		
LONGITUDE: -117.261681°	**EFFICIENCY** N/A		
STATION: N/A **OFFSET:** N/A	**REVIEWED BY:** DTA		
REMARKS:			

Water NONE

BORING LOCATION: Center North West

Elevation (feet)	Depth, (feet)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0	**Poorly Graded SAND**, light brown, trace silt, moist, loose.	SP			
				2-3-3 N=6	5	
		Trace Gravel		5-7-7 N=14	5	DD = 105 pcf
	5	No Gravel, rings disturbed.		5-6-6 N=12	2	DD = 100 pcf
		Boring Terminated at 6-1/2 ft. No groundwater encountered. Soil cuttings used as backfill.				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

Professional Service Industries, Inc.
11980 Telegraph Rd, Unit 104
Santa Fe Springs, CA 90670
Telephone: (714) 484-8600

PROJECT NO.: 00662055
PROJECT: Clean Energy Fuel Station
LOCATION: NWC Central Ave, and Tippecanoe Ave
San Bernardino, CA

The stratification lines represent approximate boundaries. The transition may be gradual.

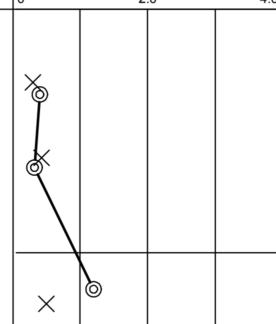
BORING B4

DATE STARTED:	4/15/21	**DRILL COMPANY:**	2R Drilling
DATE COMPLETED:	4/15/21	**DRILLER:** Juan	**LOGGED BY:** Justin
COMPLETION DEPTH	6.5 ft	**DRILL RIG:**	CME-75 Track
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	SS+SPT+CalMod
LATITUDE:	34.087234°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-117.262282°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	DTA
REMARKS:			

Water NONE

BORING LOCATION: NWC

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					**Silty SAND**, light brown, poorly graded, moist, very loose to medium dense.	SM	2-2-3 N=5	4		DD = 98 pcf 12.8%<#200
								1-2-2 N=4	5		
	5							5-7-8 N=15	6		DD = 95 pcf
						Boring Terminated at 6-1/2ft. No groundwater encountered. Soil cuttings used as backfill.					



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Santa Fe Springs, CA 90670
Telephone: (714) 484-8600

PROJECT NO.: 00662055
PROJECT: Clean Energy Fuel Station
LOCATION: NWC Central Ave, and Tippecanoe Ave
San Bernardino, CA

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B5

DATE STARTED:	4/15/21	**DRILL COMPANY:**	2R Drilling
DATE COMPLETED:	4/15/21	**DRILLER:** Juan	**LOGGED BY:** Justin
COMPLETION DEPTH	6.5 ft	**DRILL RIG:**	CME-75 Track
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	SS+SPT+CalMod
LATITUDE:	34.086797°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-117.262441°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	DTA
REMARKS:			

Water NONE

BORING LOCATION: Westside

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎; × Moisture; PL; LL (0, 25, 50); STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					**Poorly Graded SAND with Silt**, light brown, moist, loose.					
								1-2-2 N=4	2		
						...with Roots	SP-SM	3-4-5 N=9	2		DD = 94 pcf
	5										
								1-2-2 N=4	4		
						Boring Terminated at 6-1/2 ft. No groundwater encountered. Soil cuttings used as backfill.					

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11980 Telegraph Rd, Unit 104
Santa Fe Springs, CA 90670
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PROJECT NO.: 00662055
PROJECT: Clean Energy Fuel Station
LOCATION: NWC Central Ave, and Tippecanoe Ave
San Bernardino, CA

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B6

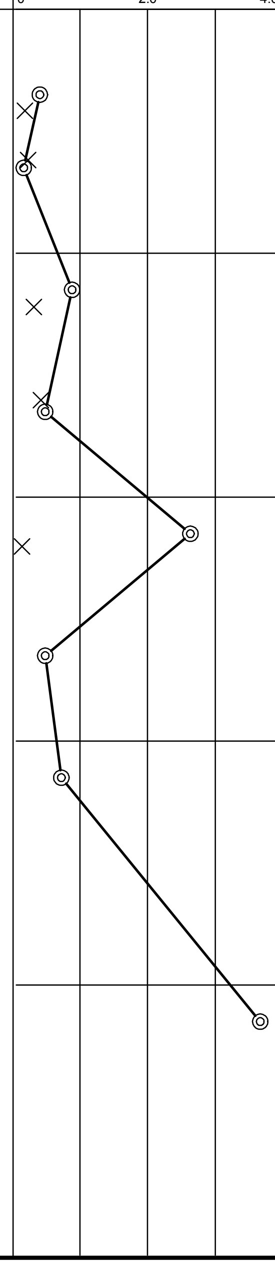
DATE STARTED:	4/15/21	**DRILL COMPANY:**	2R Drilling
DATE COMPLETED:	4/15/21	**DRILLER:** Juan	**LOGGED BY:** Justin
COMPLETION DEPTH	21.5 ft	**DRILL RIG:**	CME-75 Track
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	SS+SPT+CalMod
LATITUDE:	34.086198°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-117.262386°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	DTA
REMARKS:			

Water NONE

BORING LOCATION: Dispensers

Depth, (feet)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
0	**Silty SAND**, light brown, trace gravel, poorly graded, moist, very loose.	SM	1-2-3 N=5	2	DD = 101 pcf 27.3%<#200 Direct Shear Direct Shear Proctor
			0-1-1 N=2	3	
5	**Silty SAND**, light brown, poorly graded sand, moist, loose. (Ring sample disturbed)	SM	4-5-6 N=11	4	DD = 83 pcf 39.5%<#200
	Poorly Graded SAND, light brown, trace silt, moist, loose to medium dense.	SP	2-2-4 N=6	5	
10			13-16-17 N=33	2	DD = 103 pcf
	Silty SAND, light brown, poorly graded sand, moist, loose.	SM	3-3-3 N=6		
15	**Poorly Graded SAND**, light brown, trace silt, moist, loose.	SP	4-4-5 N=9		
20	**Poorly Graded SAND with Gravel**, grayish brown, moist, dense.	SP	16-17-29 N=46		
	Boring Terminated at 21-1/2 ft. No groundwater encountered. soil cuttings used as backfill.				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0



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Professional Service Industries, Inc.
11980 Telegraph Rd, Unit 104
Santa Fe Springs, CA 90670
Telephone: (714) 484-8600

PROJECT NO.: 00662055
PROJECT: Clean Energy Fuel Station
LOCATION: NWC Central Ave, and Tippecanoe Ave San Bernardino, CA

The stratification lines represent approximate boundaries. The transition may be gradual.

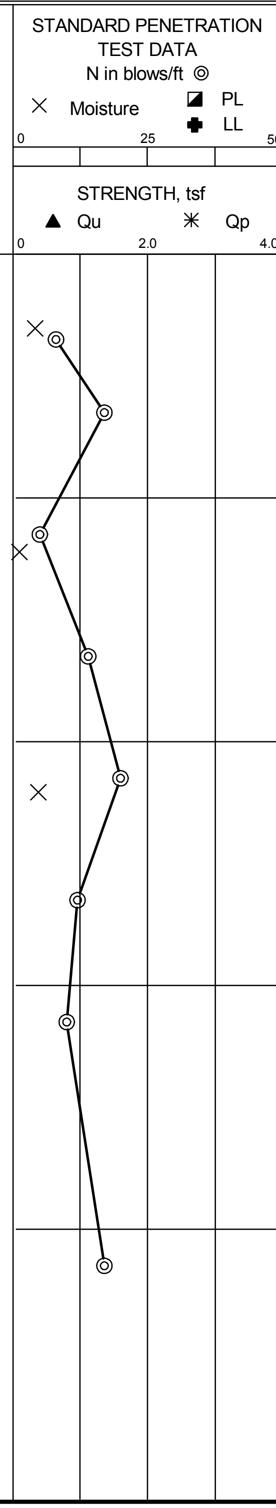
BORING B7

DATE STARTED:	4/15/21	**DRILL COMPANY:**	2R Drilling
DATE COMPLETED:	4/15/21	**DRILLER:** Juan	**LOGGED BY:** Justin
COMPLETION DEPTH	21.5 ft	**DRILL RIG:**	CME-75 Track
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	SS+SPT+CalMod
LATITUDE:	34.086406°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-117.261773°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	DTA
REMARKS:			

Water NONE

BORING LOCATION: Equipment Pad

Depth, (feet)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
0	**Silty SAND**, light brown, trace gravel, poorly graded, moist, plastic, carpet, (Fill)	SM			16.8%<#200 Sulfate PH Chloride
			2-4-4 N=8	4	
	No Recovery on Rings. (Native)				
	Poorly Graded SAND with Silt, light brown, trace gravel, moist, medium dense.		5-8-9 N=17		
5	... becomes loose	SP-SM	2-2-3 N=5	1	
	No Recovery on Rings.		5-6-8 N=14		
10	**Silty SAND**, light brown, poorly graded sand, moist, medium dense.	SM	9-10-10 N=20	5	DD = 97 pcf 34.9%<#200
	Poorly Graded SAND, light brownish-gray, trace silt, moist, medium dense.		5-6-6 N=12		
15		SP	4-5-5 N=10		
20			4-7-10 N=17		
	Boring terminated at 21-1/2 ft. No groundwater encountered. Soil cuttings used as backfill.				



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PROJECT NO.: 00662055
PROJECT: Clean Energy Fuel Station
LOCATION: NWC Central Ave, and Tippecanoe Ave San Bernardino, CA

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BORING B8

DATE STARTED:	4/15/21	DRILL COMPANY:	2R Drilling
DATE COMPLETED:	4/15/21	DRILLER:	Juan — LOGGED BY: Justin
COMPLETION DEPTH	16.5 ft	DRILL RIG:	CME-75 Track
BENCHMARK:	N/A	DRILLING METHOD:	Hollow Stem Auger
ELEVATION:	N/A	SAMPLING METHOD:	SS+SPT+CalMod
LATITUDE:	34.086752°	HAMMER TYPE:	Automatic
LONGITUDE:	-117.261736°	EFFICIENCY	N/A
STATION: N/A	OFFSET: N/A	REVIEWED BY:	DTA
REMARKS:			

Water: NONE

BORING LOCATION: West Basin

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎; × Moisture; PL; LL (0–25–50); STRENGTH, tsf ▲ Qu ✳ Qp (0–2.0–4.0)	Additional Remarks
	0					**Silty SAND**, grayish light brown, trace gravel, poorly graded, moist, loose.	SM				
								2-2-4 N=6	7		
	5					No Gravel		3-3-3 N=6	2		19.5%<#200
								3-6-7 N=13	1		DD = 101 pcf
	10					**Silty SAND**, light brown, moist, loose.	SM	2-3-4 N=7	7		
						Poorly Graded SAND, light brown, trace silt, moist, medium dense.	SP	9-11-12 N=23			
	15					... becomes reddish brown, loose.		3-4-5 N=9			
						Boring Terminated at 16-1/2 ft. No groundwater encountered. soil cuttings used as backfill.					

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PROJECT NO.: 00662055
PROJECT: Clean Energy Fuel Station
LOCATION: NWC Central Ave, and Tippecanoe Ave
San Bernardino, CA

The stratification lines represent approximate boundaries. The transition may be gradual.

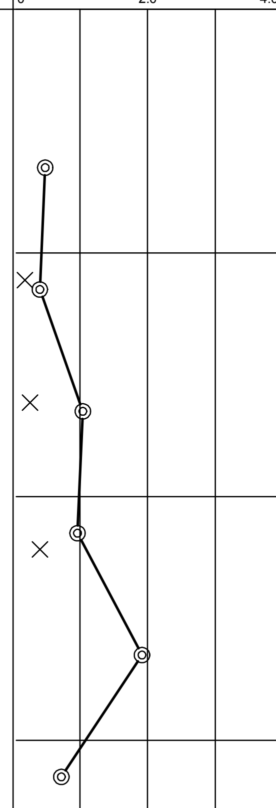
BORING B9

DATE STARTED:	4/15/21	**DRILL COMPANY:**	2R Drilling
DATE COMPLETED:	4/15/21	**DRILLER:** Juan	**LOGGED BY:** Justin
COMPLETION DEPTH	16.5 ft	**DRILL RIG:**	CME-75 Track
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	SS+SPT+CalMod
LATITUDE:	34.086721°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-117.260724°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	DTA
REMARKS:			

Water: NONE

BORING LOCATION:
East Basin

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ / × Moisture / PL / LL (0–25–50) / STRENGTH, tsf ▲ Qu / ✳ Qp (0–2.0–4.0)	Additional Remarks
	0					**Silty SAND**, light gray, poorly graded, moist, loose.					
						No Recovery		2-3-3 N=6			
	5							2-2-3 N=5	2		24.2%<#200
							SP	5-5-8 N=13	3		DD = 89 pcf
	10					... becomes light brown, medium dense.		4-6-6 N=12	5		
						Rings disturbed.		7-12-12 N=24			
	15					... becomes loose.		4-4-5 N=9			
						Boring Terminated at 16-1/2 ft. No groundwater encountered. Soil cuttings used as backfill.					



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11980 Telegraph Rd, Unit 104
Santa Fe Springs, CA 90670
Telephone: (714) 484-8600

PROJECT NO.: 00662055
PROJECT: Clean Energy Fuel Station
LOCATION: NWC Central Ave, and Tippecanoe Ave
San Bernardino, CA

The stratification lines represent approximate boundaries. The transition may be gradual.

LABORATORY TESTING PROGRAM AND PROCEDURES

Soil samples obtained during the field explorations were examined in our laboratory. The physical characteristics of the samples were noted, and the field classifications were modified, where necessary. Representative samples were selected during the course of the examination for further testing.

Laboratory testing included moisture content (ASTM D2216), density (ASTM D2937), maximum dry density/optimum moisture content (ASTM D1557), gradation wash (ASTM D1140), gradation (ASTM D6913), direct shear testing (ASTM D3080), pH and soluble sulfates (AASHTO T-290), and soluble chloride AASHTO T-291). Laboratory testing was performed in general accordance with ASTM and AASHTO procedures. Unless otherwise informed, the soil samples collected during our investigation will be discarded 60 days from the issuance of this report. Laboratory test results are provided below.

Visual-Manual Classification

The soil samples were classified in general accordance with guidelines presented in ASTM D2487. Certain terminology incorporating current local engineering practice, as provided in the Soil Classification Chart, included with, or in lieu of, ASTM terminology. The term which best described the major portion of the sample was used in determining the soil type (i.e., gravel, sand, silt or clay).

Laboratory Testing Results

Boring Number	Sample Depth (feet)	Lab Test	Results
B1	1 - 3	%<#200 Wash	8.2
B4	1 – 2½	%<#200 Wash	12.8
B6	1 - 3	%<#200 Wash	27.3
B6	2	Direct Shear Insitu	See Plot
B6	2	Direct Shear Remold	See Plot
B6	6	%<#200 Wash	39.5
B7	1 – 2	%<#200 Wash	16.8
B7	11	%<#200 Wash	34.9
B8	6	%<#200 Wash	19.5
B9	6	%<#200 Wash	24.2

Soil Expansion

The expansion potential of the existing near-surface site soils is estimated to be **Very Low** due to the granular characteristics of the material and lack of plasticity. Following site grading, testing of site soils should be performed by the project geotechnical consultant to confirm the basis of these recommendations. Depending upon the distribution of soil types and expansion/swell characteristics, differing design recommendations may be developed to better suit the types of conditions present at the site.

Corrosion Testing

The United States Department of Agriculture (USDA) National Resources Conservation Service (NRCS) soil survey mapping of the area indicates that the soils located below the site consist of gravelly loamy sand of the Tujunga (TvC) series. These soils are characterized as having a low risk for corrosion to concrete and steel. Site testing of corrosion was performed on bulk samples of the site soils as described below.

Soluble salt testing was performed on a near-surface soil sample to evaluate the corrosivity of the onsite soils and the potential for attack on concrete and subsurface utility pipes, specifically cast iron and ductile iron. The salts tested included soluble sulfate and chloride. Testing was performed using AASHTO methods T-290 and T-291and test results are provided above.

Corrosion Analyses Test Results

Boring Number	Sample Depth (feet)	pH	Soluble Sulfate (ppm)	Soluble Chlorides (ppm)
B7	1 - 2	7.01	96	0.11

Notes: ppm = parts per million.

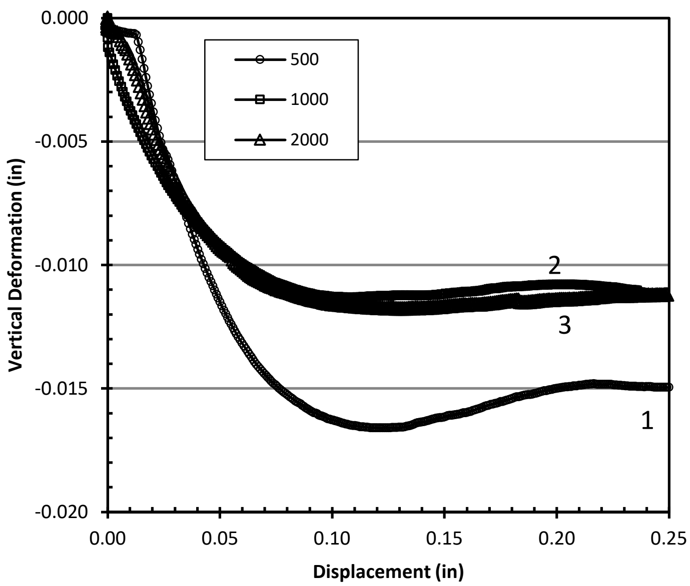
Laboratory testing of a selected soil sample indicates that the on-site soils have **negligible** levels of soluble sulfates such that they are characterized as having no corrosion potential with respect to concrete. Concrete in contact with site soils may use Type II concrete having a minimum 28 day compressive strength of at least 2,500 psi. Soluble chloride levels suggest that the site soils also have a **negligible** potential for corrosion of steel (iron/ferrous materials) according to ACI 318 guidelines. Final concrete mix design should be evaluated after sulfate and chloride tests have been performed on the actual in-place subgrade material used for finished pad grades.

Samples Tested	1	2	3	
Boring ID	**B-6**	**B-6**	**B-6**	
Depth (in/ft.)	**1-2.5**	**1-2.5**	**1-2.5**	
Initial Moisture Content (%)	2.25	2.25	2.25	
Initial Dry Density (pcf)	98.34	97.47	101.80	
Final Moisture Content (%)	24.93	26.57	21.54	
Normal Stress (psf)	500	1000	2000	
Maximum Shear Stress (psf)	300	659	1309	
Ultimate Shear Stress (psf)	284	636	1280	
ASTM D3080 Soil Type	Sand w/Silt (SP-SM)	Sand w/Silt (SP-SM)	Sand w/Silt (SP-SM)	

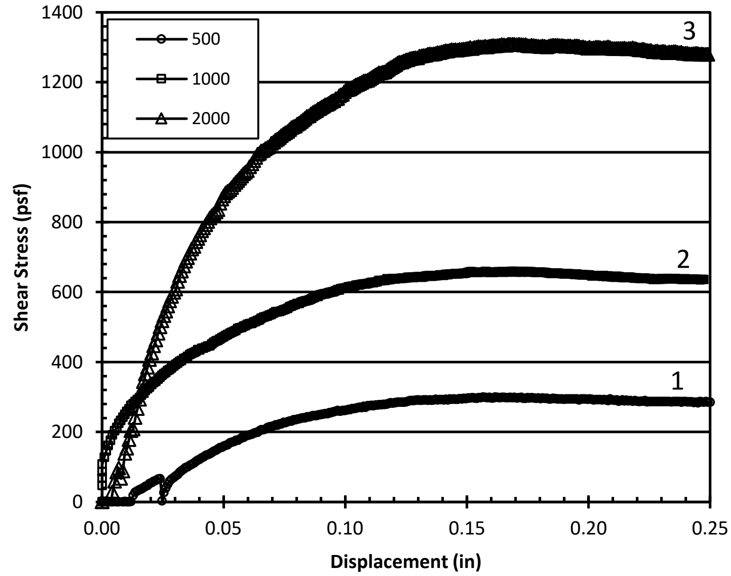
	Peak	Ultim.
Friction, ϕ (Deg)	33	33
Cohesion (psf)	0	0

Sample Type:	InSitu
Method:	Drained
Consolidation:	Yes
Saturation:	Yes
Strain Rate (in/min):	0.0033

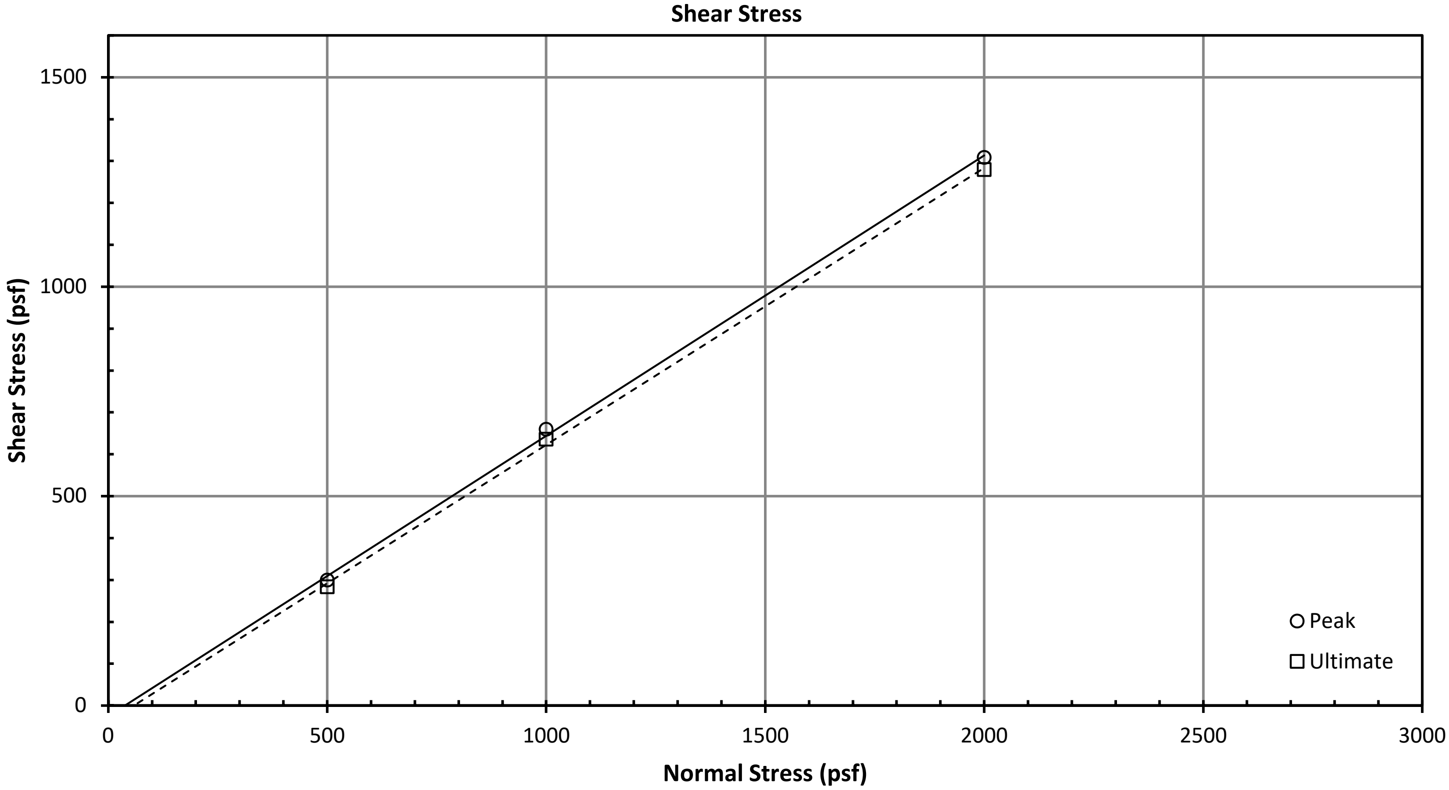
Vertical Deformation v. Displacement



Shear Stress v. Displacement



Shear Stress

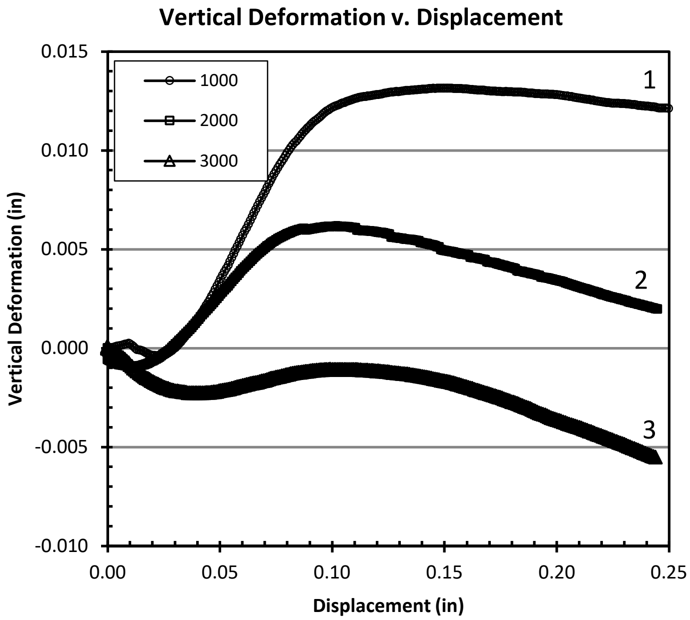


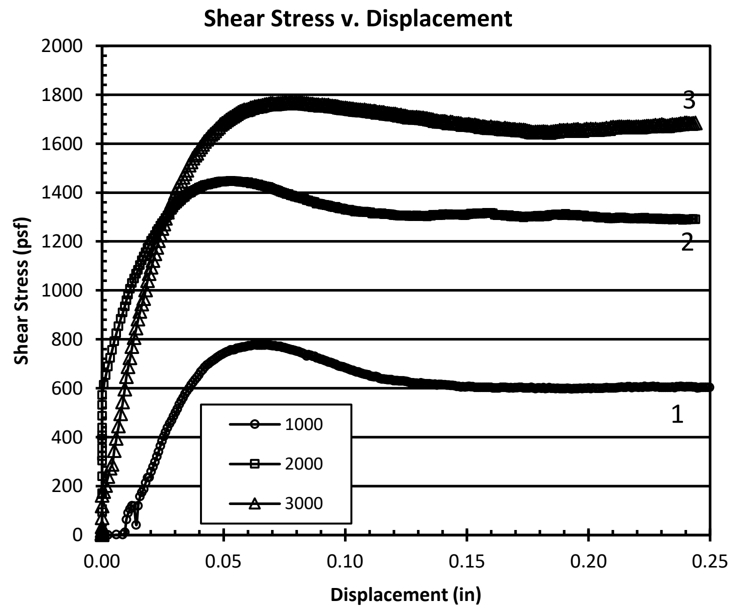
	DIRECT SHEAR TEST RESULTS	P.N.: 00662055-4
	CNG Fueling Station - San Bernardino	Date: 4/27/2021
	NWC Tippecanoe Ave + Central Ave, San Bernardino, CA	

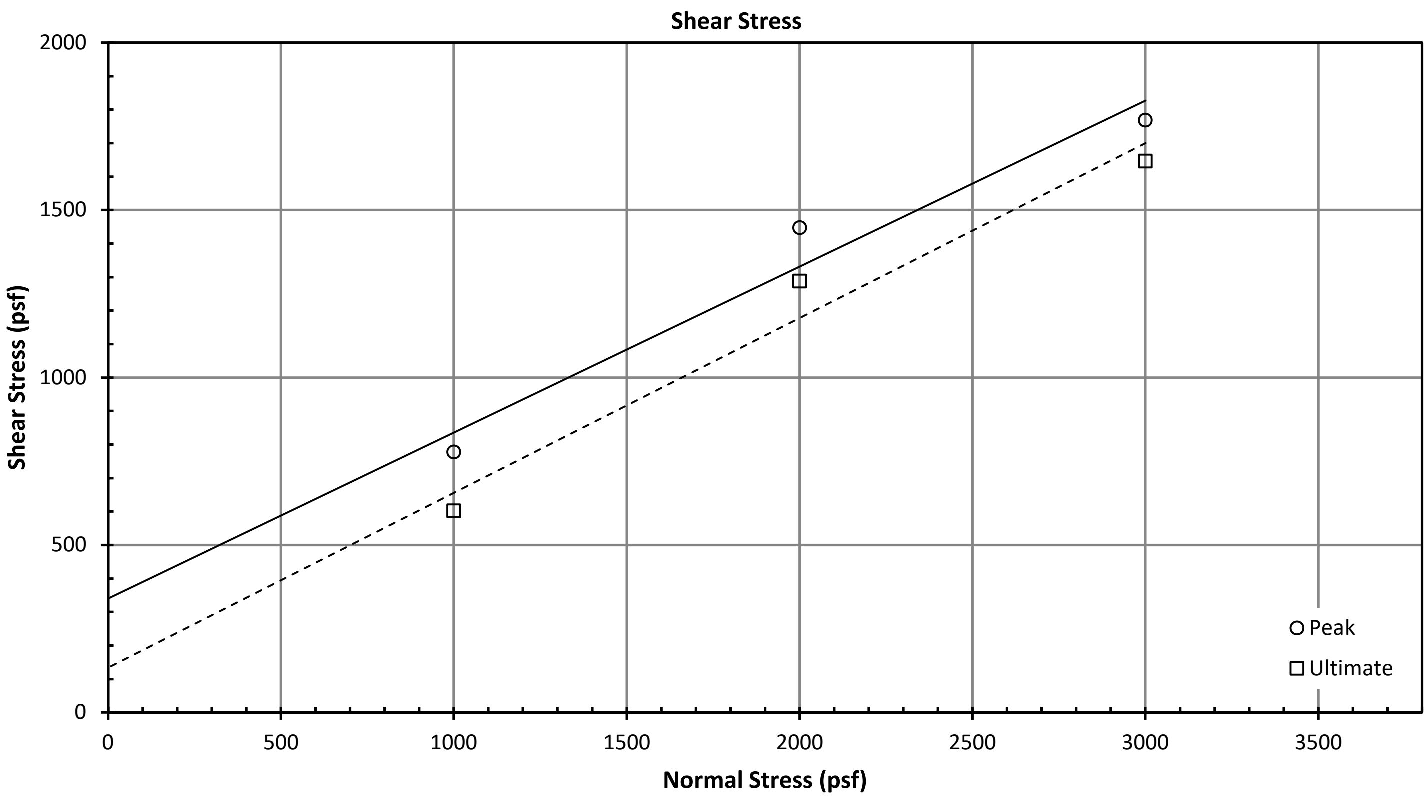
Samples Tested	1	2	3	
Boring ID	**B-6**	**B-6**	**B-6**	
Depth (in/ft.)	**1-3'**	**1-3'**	**1-3'**	
Initial Moisture Content (%)	9.20	9.20	9.20	
Initial Dry Density (pcf)	109.29	109.29	109.29	
Final Moisture Content (%)	18.30	23.63	24.26	
Normal Stress (psf)	1000	2000	3000	
Maximum Shear Stress (psf)	777	1448	1768	
Ultimate Shear Stress (psf)	602	1288	1646	
ASTM D3080 Soil Type	Silty Sand (SM)	Silty Sand (SM)	Silty Sand (SM)	

	Peak	Ultim.
Friction, ϕ (Deg)	27	27
Cohesion (psf)	340	134

Sample Type:	Remolded
Method:	Drained
Consolidation:	Yes
Saturation:	Yes
Strain Rate (in/min):	0.0032







	DIRECT SHEAR TEST RESULTS	P.N.: 00662055-4
intertek psi	Clean Energy - San Bernardino	Date: 5/3/2021
	NWC Tippecanoe Ave + Central Ave, San Bernardino, CA	

Water-Soluble Sulfate Ion Content in Soil
AASHTO T 290-95 (2020)

		PROJECT NAME :	CNG Fueling Station - SB
		PROJECT NUMBER:	00662055-4
Sample Location:	B-7 Bulk	Date:	04/30/21
Depth:	1-2'	Tested By:	SE
Sample Description:	Brown Silty Sand (SM)		

Measurement of Barium Chloride Turbidity:

Sample Weight:	100.0 g	**Tare ID:**	0.000
Water Added to Sample:	300.0 ml	**Weight of Tare + Wet:**	0.000 g
Size of Sample Aliquot:	10.0 ml	**Weight of Tare + Dry:**	0.000 g
Sample Reading:	79.0 FAU	**Weight of Tare:**	0.000 g
		Weight of Water:	0.000 g
		Weight of Dry Sample:	0.000 g
		Water Content:	0.000 %

Sample Sulfate Ion Concentration:	**32**	mg/L SO_4 (ppm)
Sample Sulfate Ion Content:	**96**	mg/kg SO_4 (not corrected for moisture)
Sample Sulfate Ion Content:	**96**	mg/kg SO_4 (corrected for moisture)

Measurement of pH in Soil:

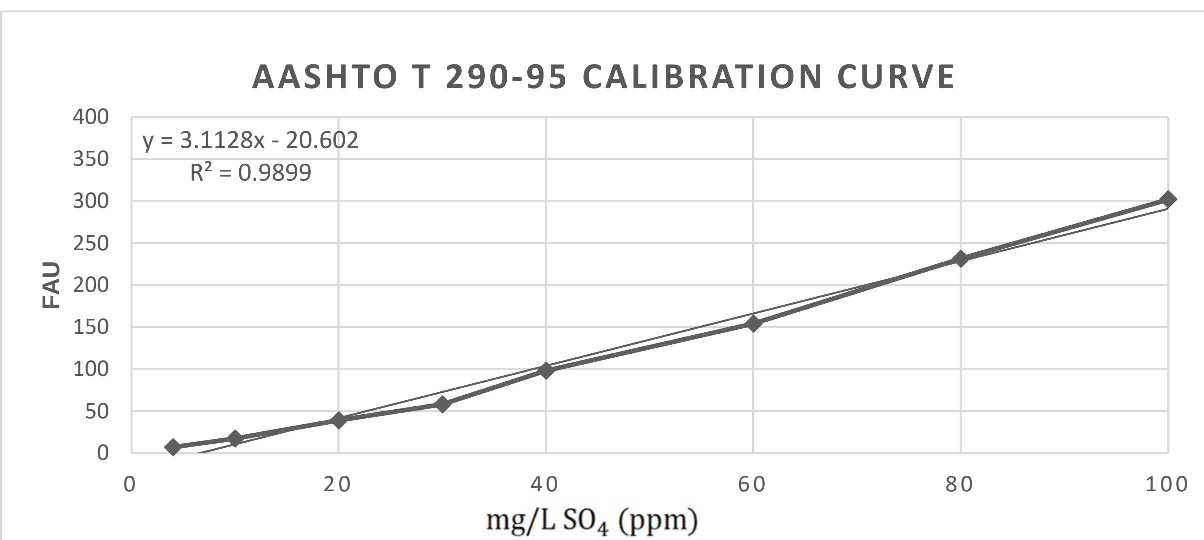
pH: **7.01**

Sulfate Ion Concentration (mg/L)

0	4	10	20	30	40	60	80	100

Spectrophotometer Reading (FAU)

Underage	7	17	39	58	98	154	231	302



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Santa Fe Springs, CA
714-484-8600

Water-Soluble Chloride Ion Content in Soil
AASHTO T 291-94 (2018)

PROJECT NAME :	CNG Fueling Station - SB
PROJECT NUMBER:	00662055-4
Date:	04/30/21
Tested By:	SE

Sample Location:	B-7 Bulk
Depth:	1-2'
Sample Description:	Brown Silty Sand (SM)

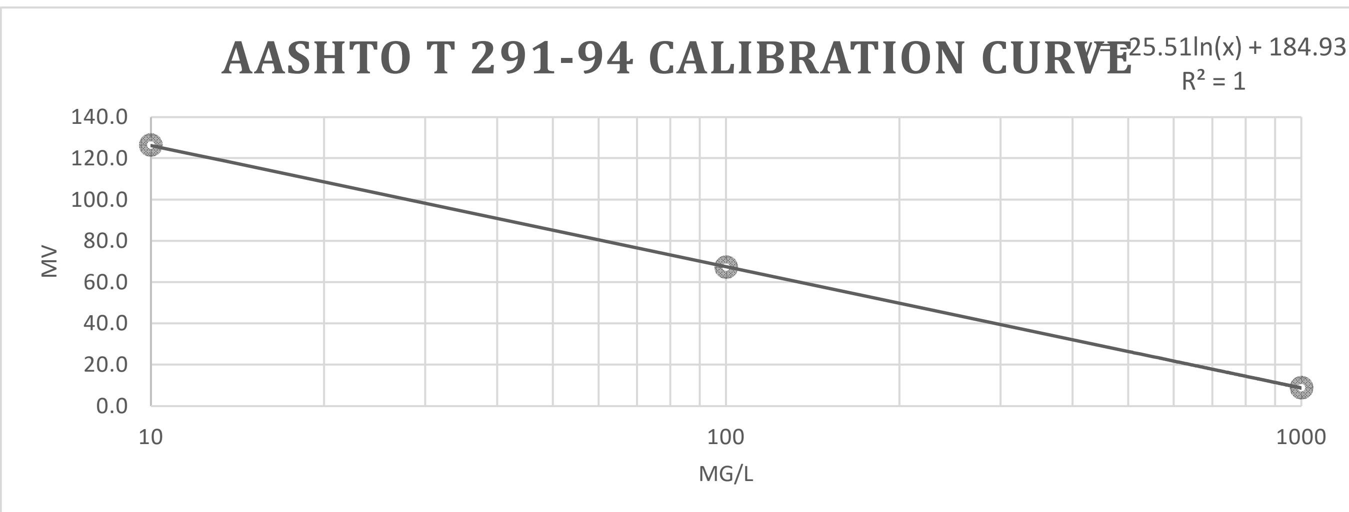
Sample Weight:	100.0	g
Water Added to Sample:	300.0	ml
Size of Sample Aliquot:	10.0	ml
Sample Reading:	277.0	mV

Concentration:	**0.11**	mg/L
Concentration:	**0.11**	mg/kg

Measurement of pH in Soil:

pH: **7.01**

Concentration Standards:		mV Readings:	
10	mg/L	126.3	mV
100	mg/L	67.2	mV
1000	mg/L	8.8	mV



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Professional Service Industries, Inc.
11980 Telegraph Road, Unit 104
Santa Fe Springs, CA 90670

Phone: (714) 484-8600
Fax: (562) 777-0899

Report No: PTR:00662055-4-S1
Issue No: 1

Proctor Report

These test results apply only to the specific locations and materials noted and may not represent any other locations or elevations. This report may not be reproduced, except in full, without written permission by Professional Service Industries, Inc. If a non-compliance appears on this report, to the extent that the reported non-compliance impacts the project, the resolution is outside the PSI scope of engagement.

Client: CLEAN ENERGY
4675 MACARTHUR CT, SUITE 800
NEWPORT BEACH, CA
92660-1895

CC:

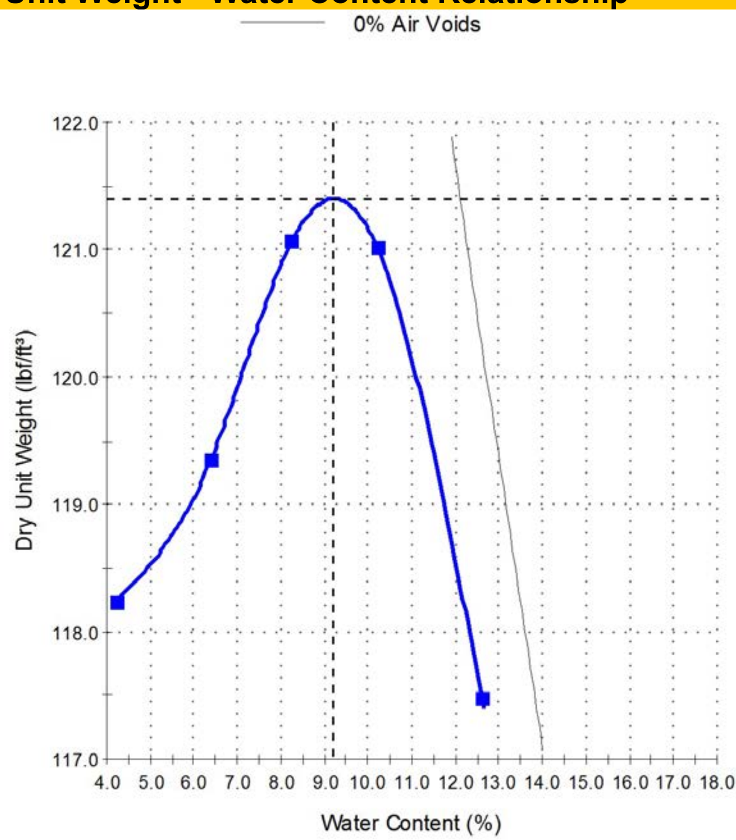
Project: CLEAN ENERGY SAN BERNARDINO
SAN BERNARDINO, CA

Approved Signatory: Douglas Abernathy (Senior Project Engineer)
Date of Issue: 4/30/2021

Sample Details

Sample ID:	00662055-4-S1	**Date Sampled:**	4/15/2021
Sampled By:	Justin McRaney	**Specification:**	All Sieves
Supplier:	On-Site Material	**Source:**	On Site Borrow
Material:	Light Grayish Brown Silty Sand (SM)	**Sampling Method:**	Hollow Stem Auger - Automatic
General Location:	Boring 6	**Location:**	B-6 BULK @ 1-3'
Tested By:	Shahab Emami	**Date Tested:**	4/28/2021

Dry Unit Weight - Water Content Relationship



Test Results

ASTM D 1557

Maximum Dry Unit Weight (lbf/ft³):	**121.4**
Optimum Water Content (%):	**9.2**
Method:	A
Preparation Method:	Dry
Rammer Type:	Automatic Hammer
Specific Gravity (Fines):	2.55
Specific Gravity Method:	estimate
Tested By:	Shahab Emami
Date Tested:	4/28/2021

Comments

APPENDIX B

INFILTRATION TESTING

Riverside County Percolation Test Procedure

Boring Percolation Test Datasheet

Client: Clean Energy
Project: San Bernardino ~ Infiltration
Address: NWC Central Avenue and Tippecanoe Avenue

Date: 4/16/2021
Work Order No.: 00662055
Technician: Justin McRaney
Weather: Sunny

Test Hole Number/Location: **P1**

Depth of Total Test Hole bottom below land surface (inches): 60 inches (Stickup: 2 inches)

Test hole cross-section (check a box and indicate size):

☑ Diameter: 8 inches ☐ Square: ______ inches

The land surface at the top of the test hole is (check one):

☐ Undisturbed Native Soil ☐ Cut Surface ☐ Fill Surface

☑ Other (describe): Disturbed Surface

Max Head during testing = 24.0 inches

Average Head during testing = 12.0 inches

Soil Data from Test Hole:

Depth (ft)	Soil Description Boring B8
0-9.5	Silty SAND, grayish-light brown, trace gravel, poorly graded, moist, loose.
9.5-12	Silty SAND, light brown, moist, loose.
12-16.5	Poorly Graded SAND, light brown, trace silt, moist, medium dense to loose.

Test Hole Presoaking

Presoak 5gal = If 6" drains away in 25 min. (x2), Test @10min. If not, presoak >15 hours, Test @30min.

Run #	Start Time (H:M)	Start Depth to WL (ft)	End Depth to WL (ft)	End Time (min)	Measured Water Drop (in)	Elapsed Time Int. (min)	
1	0:00	3	5.2	1.83	26.4	1.83	Performed on 4/16/21
2	0:00	3	5.2	2	26.4	2.08	Performed on 4/16/21

Test Hole Percolation:

Fill 5x Radius Testing Performed on 4/16/21

Run #	Start Time (H:M)	Start Depth to WL (ft)	End Depth to WL (ft)	Elapsed Time (min)	Measured Water Drop (inches)	Time % Change (<10%?)	Elapsed Total Time (min)	Percolation Rate (min/in)	Infiltration Rate (in/hr) Porchet Method
1	0:00	3.2	5.2	3.17	24.0		3.17	0.13	65.0
2	0:00	3.2	5.2	3.67	24.0	16%	6.83	0.15	56.1
3	0:00	3.2	5.2	4.00	24.0	9%	10.83	0.17	51.4
4	0:00	3.2	5.2	4.30	24.0	8%	15.13	0.18	47.8
5	0:00	3.2	5.2	4.30	24.0	0%	19.43	0.18	47.8
6	0:00	3.2	5.2	4.45	24.0	3%	23.88	0.19	46.2
7									

Need 3 consecutive readings <10% change to Finalize and Stop

Final Stabilized Percolation Rate: **46.2** in/hr

Reference: County of San Bernardino (9/19/13) refers to Orange County TGD (5/19/11) which refers to Riverside County's Percolation Test Procedure.

Riverside County Percolation Test Procedure

Boring Percolation Test Datasheet

Client: Clean Energy
Project: San Bernardino ~ Infiltration
Address: NWC Central Avenue and Tippecanoe Avenue

Date: 4/15/2021
Work Order No.: 00662055
Technician: Justin McRaney
Weather: Sunny

Test Hole Number/Location: **P2**

Depth of Total Test Hole bottom below land surface (inches): 60 inches (Stickup: 1 inch)

Test hole cross-section (check a box and indicate size):

☑ Diameter: 8 inches ☐ Square: ______ inches

The land surface at the top of the test hole is (check one):

☐ Undisturbed Native Soil ☐ Cut Surface ☐ Fill Surface

☑ Other (describe): Disturbed Surface

Max Head during testing = 24.0 inches

Average Head during testing = 14.7 inches

Soil Data from Test Hole:

Depth (ft)	Soil Description Boring B9
0-16.5	Silty SAND, light gray, poorly graded, moist, loose to medium dense.

Test Hole Presoaking

Presoak 5gal = If 6" drains away in 25 min. (x2), Test @10min. If not, presoak >15 hours, Test @30min.

Run #	Start Time (H:M)	Start Depth to WL (ft)	End Depth to WL (ft)	End Time (min)	Measured Water Drop (inches)	Elapsed Time Int. (min)	
1	0:00	1.85	5.1	8.42	39	8.42	Performed on 4/15/21
2	0:00	1.6	5.1	9.00	42	9.00	Performed on 4/15/21

Test Hole Percolation:

Fill 5x Radius Testing Performed on 4/15/21

Run #	Start Time (H:M)	Start Depth to WL (ft)	End Depth to WL (ft)	Elapsed Time (min)	Measured Water Drop (inches)	WL % Change (<10%?)	Elapsed Total Time (min)	Percolation Rate (min/in)	Infiltration Rate (in/hr) Porchet Method
1	0:00	3.1	4.9	10	21.6		10	0.46	15.5
2	0:30	3.1	4.9	10	21.0	3%	20	0.48	15.1
3	1:00	3.1	4.9	10	21.0	0%	30	0.48	15.1
4	1:30	3.1	4.7	10	18.6	11%	40	0.54	13.4
5	2:00	3.1	4.7	10	18.6	0%	50	0.54	13.4
6	2:30	3.1	4.7	10	18.6	0%	60	0.54	13.4
7	3:00	3.1	4.7	10	18.6	0%	70	0.54	13.4
8									

Need 3 consecutive readings <10% change to Finalize and Stop

Final Stabilized Percolation Rate: **13.4** in/hr

Reference: County of San Bernardino (9/19/13) refers to Orange County TGD (5/19/11) which refers to Riverside County's Percolation Test Procedure.

Riverside County Percolation Test Procedure

Boring Percolation Test Datasheet

Client: Clean Energy
Project: San Bernardino ~ Infiltration
Address: NWC Central Avenue and Tippecanoe Avenue

Date: 4/16/2021
Work Order No.: 00662055
Technician: Justin McRaney
Weather: Sunny

Test Hole Number/Location: **P3**

Depth of Total Test Hole bottom below land surface (inches): 60 inches (Stickup: 1 inch)

Test hole cross-section (check a box and indicate size):

☑ Diameter: 8 inches ☐ Square: ______ inches

The land surface at the top of the test hole is (check one):

☐ Undisturbed Native Soil ☐ Cut Surface ☐ Fill Surface

☑ Other (describe): Disturbed Surface

Max Head during testing = 24.0 inches
Average Head during testing = 12.0 inches

Soil Data from Test Hole:

Depth (ft)	Soil Description Boring B9
0-16.5	Silty SAND, light gray, poorly graded, moist, loose to medium dense.

Test Hole Presoaking

Presoak 5gal = If 6" drains away in 25 min. (x2), Test @10min. If not, presoak >15 hours, Test @30min.

Run #	Start Time (H:M)	Start Depth to WL (ft)	End Depth to WL (ft)	End Time (min)	Measured Water Drop (inches)	Elapsed Time Int. (min)	
1	0:00	2.6	5.1	3.75	30	3.75	Performed on 4/16/21
2	0:00	2.1	5.1	5.17	36	8.92	Performed on 4/16/21

Test Hole Percolation:

Fill 5x Radius Testing Performed on 4/16/21

Run #	Start Time (H:M)	Start Depth to WL (ft)	End Depth to WL (ft)	Elapsed Time (min)	Measured Water Drop (inches)	Time % Change (<10%?)	Elapsed Total Time (min)	Percolation Rate (min/in)	Infiltration Rate (in/hr) Porchet Method
1	0:00	3.1	5.1	5.87	24.0		5.87	0.24	35.0
2	0:00	3.1	5.1	6.25	24.0	6%	12.12	0.26	32.9
3	0:00	3.1	5.1	7.12	24.0	14%	19.24	0.30	28.9
4	0:00	3.1	5.1	7.25	24.0	2%	26.49	0.30	28.4
5	0:00	3.1	5.1	7.58	24.0	5%	34.07	0.32	27.1
6	0:00	3.1	5.1	8.08	24.0	7%	42.15	0.34	25.5
7	0:00	3.1	5.1	8.18	24.0	1%	50.33	0.34	25.1
8	0:00	3.1	5.1	8.30	24.0	1%	58.63	0.35	24.8

Need 3 consecutive readings <10% change to Finalize and Stop

Final Stabilized Percolation Rate: **24.8** in/hr

Reference: County of San Bernardino (9/19/13) refers to Orange County TGD (5/19/11) which refers to Riverside County's Percolation Test Procedure.

Riverside County Percolation Test Procedure

intertek psi

Boring Percolation Test Datasheet

Client: Clean Energy
Project: San Bernardino ~ Infiltration
Address: NWC Central Avenue and Tippecanoe Avenue

Date: 4/16/2021
Work Order No.: 00662055
Technician: Justin McRaney
Weather: Sunny

Test Hole Number/Location: **P4**

Depth of Total Test Hole bottom below land surface (inches): 60 inches (Stickup: 2 inches)

Test hole cross-section (check a box and indicate size):

☑ Diameter: 8 inches ☐ Square: ________ inches

The land surface at the top of the test hole is (check one):

☐ Undisturbed Native Soil ☐ Cut Surface ☐ Fill Surface

☑ Other (describe): Disturbed Surface

Max Head during testing = 24.0 inches

Average Head during testing = 12.0 inches

Soil Data from Test Hole:

Depth (ft)	Soil Description Boring B9
0-16.5	Silty SAND, light gray, poorly graded, moist, loose to medium dense.

Test Hole Presoaking

Presoak 5gal = If 6" drains away in 25 min. (x2), Test @10min. If not, presoak >15 hours, Test @30min.

Run #	Start Time (H:M)	Start Depth to WL (ft)	End Depth to WL (ft)	End Time (min)	Measured Water Drop (inches)	Elapsed Time Int. (min)	
1	0:00	2.7	5.2	2.67	30	2.67	Performed on 4/16/21
2	0:00	2.2	5.2	4.58	36	4.58	Performed on 4/16/21

Test Hole Percolation:

Fill 5x Radius Testing Performed on 4/16/21

Run #	Start Time (H:M)	Start Depth to WL (ft)	End Depth to WL (ft)	Elapsed Time (min)	Measured Water Drop (inches)	Time % Change (<10%?)	Elapsed Total Time (min)	Percolation Rate (min/in)	Infiltration Rate (in/hr) Porchet Method
1	0:00	3.2	5.2	4.63	24.0		4.63	0.19	44.4
2	0:00	3.2	5.2	5.23	24.0	13%	9.86	0.22	39.3
3	0:00	3.2	5.2	5.83	24.0	11%	15.69	0.24	35.3
4	0:00	3.2	5.2	6.17	24.0	6%	21.86	0.26	33.3
5	0:00	3.2	5.2	6.53	24.0	6%	28.39	0.27	31.5
6	0:00	3.2	5.2	6.75	24.0	3%	35.14	0.28	30.5
7	0:00	3.2	5.2	6.92	24.0	3%	42.06	0.29	29.7
8									

Need 3 consecutive readings <10% change to Finalize and Stop

Final Stabilized Percolation Rate: **29.7** in/hr

Reference: County of San Bernardino (9/19/13) refers to Orange County TGD (5/19/11) which refers to Riverside County's Percolation Test Procedure.

Riverside County Percolation Test Procedure

intertek psi

Boring Percolation Test Datasheet

Client: Clean Energy
Project: San Bernardino ~ Infiltration
Address: NWC Central Avenue and Tippecanoe Avenue

Date: 4/16/2021
Work Order No.: 00662055
Technician: Justin McRaney
Weather: Sunny

Test Hole Number/Location: **P5**

Depth of Total Test Hole bottom below land surface (inches): 60 inches (Stickup: 0 inches)

Test hole cross-section (check a box and indicate size):

☑ Diameter: 8 inches ☐ Square: ______ inches

The land surface at the top of the test hole is (check one):

☐ Undisturbed Native Soil ☐ Cut Surface ☐ Fill Surface

☑ Other (describe): Disturbed Surface

Max Head during testing = 24.0 inches

Average Head during testing = 12.0 inches

Soil Data from Test Hole:

Depth (ft)	Soil Description Boring B9
0-16.5	Silty SAND, light gray, poorly graded, moist, loose to medium dense.

Test Hole Presoaking

Presoak 5gal = If 6" drains away in 25 min. (x2), Test @10min. If not, presoak >15 hours, Test @30min.

Run #	Start Time (H:M)	Start Depth to WL (ft)	End Depth to WL (ft)	End Time (min)	Measured Water Drop (inches)	Elapsed Time Int. (min)	
1	0:00	2.5	5	8.42	30	8.42	Performed on 4/16/21
2	0:00	2	5	9.00	36	9.00	Performed on 4/16/21

Test Hole Percolation:

Fill 5x Radius Testing Performed on 4/16/21

Run #	Start Time (H:M)	Start Depth to WL (ft)	End Depth to WL (ft)	Elapsed Time (min)	Measured Water Drop (inches)	Time % Change (<10%?)	Elapsed Total Time (min)	Percolation Rate (min/in)	Infiltration Rate (in/hr) Porchet Method
1	0:00	3	5.0	4.80	24.0		4.80	0.20	42.9
2	0:00	3	5.0	5.33	24.0	11%	10.13	0.22	38.6
3	0:00	3	5.0	5.62	24.0	5%	15.75	0.23	36.6
4	0:00	3	5.0	5.92	24.0	5%	21.67	0.25	34.7
5	0:00	3	5.0	6.08	24.0	3%	27.75	0.25	33.8
6	0:00	3	5.0	6.33	24.0	4%	34.08	0.26	32.5
7									

Need 3 consecutive readings <10% change to Finalize and Stop

Final Stabilized Percolation Rate: **32.5** in/hr

Reference: County of San Bernardino (9/19/13) refers to Orange County TGD (5/19/11) which refers to Riverside County's Percolation Test Procedure.

APPENDIX 6

LINSCOTT LAW & GREENSPAN

engineers

TRAFFIC IMPACT ANALYSIS REPORT

CNG FUELING STATION PROJECT

San Bernardino, California

September 29, 2021

Prepared for:

Clean Energy Fuels
4675 MacArthur Court, Suite 800
Newport Beach, CA 92660

LLG Ref. 2-21-4427-1

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EXECUTIVE SUMMARY

Project Description

- The proposed Project is generally located on the northwest corner of Tippecanoe Avenue at Central Avenue in the City of San Bernardino, California. The Project site is currently vacant and the project envisions two phases of development. Phase 1 will consist of two (2) fast-fill CNG dispensers, the support systems and equipment, the canopy and 153 time fill posts for trucks and 151 parking spaces for passenger vehicles. Phase 2 will consist of two (2) additional fast-fill CNG dispensers, 62 additional time fill posts for trucks and 89 additional regular parking spaces. As part of Phase 2, 25 passenger vehicle spaces that are part of Phase 1 will be converted to 18 time fill posts for trucks. Final development will consist of four (4) fast-fill CNG dispensers, 215 time fill posts for trucks and 215 parking spaces for passenger vehicles. The Project is anticipated to be completed by the Year 2023. Access to the Project will be provided via one (1) right-turn out only unsignalized driveway located along Tippecanoe Avenue (i.e. Project Driveway No. 1), one (1) full-egress only unsignalized driveway located along Central Avenue (i.e. Project Driveway No. 2) and one (1) full-ingress only unsignalized driveway located along Central Avenue (i.e. Project Driveway (i.e. Project Driveway No. 3).

- The proposed Project, inclusive of both the fast fill dispensers and the time fill posts, is forecast to generate 1,597 PCE daily trips, with 139 PCE trips (59 inbound, 80 outbound) produced in the AM peak hour and 178 PCE trips (103 inbound, 75 outbound) produced in the PM peak hour on a “typical” weekday.

Study Area

- Five (5) key study intersections were selected for evaluation based on discussions with City of San Bernardino Public Works Department staff. The intersections listed below provide local access to the study area and define the extent of the boundaries for this traffic impact investigation. The jurisdiction where each key study intersection is located is also identified.

  Key Study Intersections:
  1. Tippecanoe Ave at Mill St (San Bernardino)
  2. Tippecanoe Ave at Central Ave (San Bernardino)
  3. Tippecanoe Ave at Orange Show Rd/San Bernardino Ave (San Bernardino)
  4. Tippecanoe Ave at Harriman Place/I-10 WB Ramps (San Bernardino/Caltrans)
  5. Tippecanoe Ave/Anderson St at I-10 EB Ramps (Loma Linda/Caltrans)

Cumulative Projects Description

- The twenty-one (21) cumulative projects are expected to generate 42,028 daily trips (one half arriving, one half departing), with 4,259 trips (2,406 inbound and 1,853 outbound) forecast during the AM peak hour and 3,200 trips (1,441 inbound and 1,759 outbound) forecast during the PM peak hour on a "typical" weekday.

Traffic Impact Analysis

Existing Traffic Conditions

- For Existing traffic conditions, all five (5) key study intersections currently operate at acceptable LOS C or better during the AM and PM peak hours when compared to the LOS standards defined in this report.

Existing With Project Traffic Conditions

- The proposed Project ***will not*** significantly impact the five (5) key study intersections when compared to the LOS standards and significant impact criteria specified in this report. The five (5) key study intersections currently operate and are forecast to continue to operate at an acceptable LOS during the AM and PM peak hours with the addition of Project generated traffic to existing traffic.

Year 2023 With Project Traffic Conditions

- The proposed Project ***will not*** significantly impact the five (5) key study intersections when compared to the LOS standards and significant impact criteria specified in this report. The five (5) key study intersections are forecast to continue to operate at an acceptable LOS D or better during the AM and PM peak hours with the addition of Project generated traffic in the horizon Year 2023.

Site Access and Internal Circulation Evaluation

- The three (3) Project driveways are forecast to operate at acceptable LOS C or better during the AM and PM peak hours for Year 2023 With Project traffic conditions. As such, project access will be adequate. Motorists entering and exiting the Project site will be able to do so comfortably, safely, and without undue congestion.

- The on-site circulation layout of the proposed Project on an overall basis is adequate. Curb return radii have been confirmed and are generally adequate for small service/delivery (FedEx, UPS) trucks and large trucks (tractors).

Caltrans Facilities Analysis

- The two (2) state-controlled study intersections are forecast to operate at an acceptable LOS D or better during the AM peak hour and PM peak hour without and with the proposed Project for all analyzed traffic conditions.

Recommended Improvements

Existing With Project Traffic Conditions

- The results of the Existing With Project traffic conditions level of service analyses indicate that the proposed Project ***will not*** significantly impact any of the five (5) key study intersections. All five (5) key study intersections are forecast to operate at acceptable service levels under Existing With Project traffic conditions. As such, no improvement measures have been recommended.

Year 2023 With Project Traffic Conditions

- The results of the Year 2023 With Project traffic conditions level of service analyses indicate that the proposed Project ***will not*** significantly impact any of the five (5) key study intersections. All five (5) key study intersections are forecast to operate at acceptable service levels under Year 2023 With Project traffic conditions. As such, no improvement measures have been recommended.

Vehicle Miles Traveled (VMT) Analysis

- For the VMT screening analysis, *Project Screening – Step 3: Project Type Screening* was applied to the proposed Project. *Project Screening – Step 3: Project Type Screening* states that for local serving retail uses (including gas stations) less than 50,000 square feet (SF), a less than significant determination can be presumed. Local serving retail (including gas stations) generally improves the convenience of shopping close to home and has the effect of reducing vehicular travel. The proposed Project will consist of CNG time fill posts for 215 trucks and parking for 215 passenger vehicles, as well as four (4) fast fill CNG dispenser fueling positions. Therefore, based on the aforementioned criteria, this project could be screened from a VMT analysis, and could be presumed to have a less than significant impact on VMT per the City's guidelines.

TRAFFIC IMPACT ANALYSIS REPORT

CNG FUELING STATION PROJECT

San Bernardino, California

September 29, 2021

1.0 INTRODUCTION

This traffic impact analysis evaluates the potential traffic impacts and circulation needs associated with the proposed CNG Fueling Station Project (hereinafter referred to as Project). The proposed Project is generally located on the northwest corner of Tippecanoe Avenue at Central Avenue in the City of San Bernardino, California. The Project site is currently vacant and is proposed, at build out of the site, to consist of CNG time fill posts for 215 trucks and parking for 215 passenger vehicles, as well as four (4) fast fill CNG dispenser fueling positions. The Project is anticipated to be completed by the Year 2023. Vehicular access to the Project will be provided via one (1) right-turn out only unsignalized driveway located along Tippecanoe Avenue (i.e. Project Driveway No. 1), one (1) full-egress only unsignalized driveway located along Central Avenue (i.e. Project Driveway No. 2) and one (1) full-ingress only unsignalized driveway located along Central Avenue (i.e. Project Driveway No. 3).

This report documents the findings and recommendations of a traffic impact analysis conducted by Linscott, Law & Greenspan, Engineers (LLG) to determine the potential traffic impacts that the Project may have on the local and/or regional transportation network in the vicinity of the Project site. The traffic impact analysis evaluates the operating conditions at five (5) existing key study intersections within the Project vicinity, estimates the trip generation potential of the Project and forecasts future (near-term) operating conditions without and with the Project.

This traffic report satisfies the *City of San Bernardino Traffic Impact Analysis Guidelines,* dated August 2020, and is consistent with the most current *Congestion Management Program (CMP) for San Bernardino County.* The Scope of Work for this traffic study, which is included in ***Appendix A***, was developed in conjunction with City of San Bernardino Public Works Department staff.

The Project site has been visited and an inventory of adjacent area roadways and intersections was performed. Existing (i.e. baseline) AM and PM peak hour traffic information has been collected at five (5) key study intersections on a "typical" weekday for use in the preparation of intersection level of service calculations. This traffic report analyzes existing (i.e. baseline) and future near-term AM peak hour and PM peak hour traffic conditions for Existing (i.e. baseline) and Year 2023 traffic conditions without and with the proposed Project. Peak hour traffic forecasts for Year 2023 traffic conditions have been projected by increasing existing traffic volumes by an annual growth rate of three percent (3.0%) per year and adding the traffic from twenty-one (21) cumulative projects.

1.1 Study Area

Five (5) key study intersections were selected for evaluation based on discussions with City of San Bernardino Public Works Department staff. The intersections listed below provide local access to the study area and define the extent of the boundaries for this traffic impact investigation. The jurisdiction where each key study intersection is located is also identified.

Key Study Intersections:

1. Tippecanoe Avenue at Mill Street (San Bernardino)
2. Tippecanoe Avenue at Central Avenue (San Bernardino)
3. Tippecanoe Avenue at Orange Show Road/San Bernardino Avenue (San Bernardino)
4. Tippecanoe Avenue at Harriman Place/I-10 Westbound Ramps (San Bernardino/Caltrans)
5. Tippecanoe Avenue/Anderson Street at I-10 Eastbound Ramps (Loma Linda/Caltrans)

1.2 Traffic Impact Analysis Components

The Highway Capacity Manual (HCM) Delay, Volume to Capacity (V/C) ratio and corresponding Level of Service (LOS) calculations at the key study locations were used to evaluate the potential traffic-related impacts associated with area growth, cumulative projects and the Project. When necessary, this report recommends intersection improvements that may be required to accommodate future traffic volumes and restore/maintain an acceptable Level of Service and/or addresses the impact of the Project.

Included in this Traffic Impact Analysis are:

- Existing Traffic Counts,
- Estimated Project traffic generation/distribution/assignment,
- Estimated Cumulative Projects traffic generation/distribution/assignment,
- AM and PM peak hour LOS analyses for Existing (i.e. Baseline) Conditions,
- AM and PM peak hour for Existing (i.e. Baseline) Conditions with Project traffic,
- AM and PM peak hour LOS analyses for Near-Term (Year 2023) Conditions without and with Project traffic,
- Site Access and Internal Circulation Evaluation,
- Caltrans Facilities Analysis,
- Recommended Improvements (if any),
- Vehicle Miles Traveled (VMT) Assessment.

Figure 1-1 presents a Vicinity Map, which illustrates the general location of the Project and depicts the study locations and surrounding street system.

1.3 Traffic Impact Analysis Scenarios

The following scenarios are those for which volume/capacity and corresponding LOS calculations have been performed at the five (5) key study intersections for existing and near-term traffic conditions:

1. Existing (i.e. Baseline) Traffic Conditions,
2. Existing (i.e. Baseline) With Project Traffic Conditions,
3. Scenario (2) with Recommended Improvements, if any,
4. Year 2023 Without Project Traffic Conditions,
5. Year 2023 With Project Traffic Conditions,
6. Scenario (5) With Recommended Improvements, if any.

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LINSCOTT LAW & GREENSPAN engineers

NO SCALE

SOURCE: GOOGLE

KEY

(#) = STUDY INTERSECTION

= PROJECT SITE

FIGURE 1–1

VICINITY MAP

CNG FUELING STATION PROJECT, SAN BERNARDINO

2.0 PROJECT DESCRIPTION AND LOCATION

The proposed Project is generally located on the northwest corner of Tippecanoe Avenue at Central Avenue in the City of San Bernardino, California. The Project site is currently vacant and the project envisions two phases of development. Phase 1 will consist of two (2) fast-fill CNG dispensers, the support systems and equipment, the canopy and 153 time fill posts for trucks and 151 parking spaces for passenger vehicles. Phase 2 will consist of two (2) additional fast-fill CNG dispensers, 62 additional time fill posts for trucks and 89 additional regular parking spaces. As part of Phase 2, 25 passenger vehicle spaces that are part of Phase 1 will be converted to 18 time fill posts for trucks. Final development will consist of four (4) fast-fill CNG dispensers, 215 time fill posts for trucks and 215 parking spaces for passenger vehicles. The Project is anticipated to be completed by the Year 2023.

Figure 2-1 presents an aerial image of the existing site for the proposed Project. ***Figure 2-2*** presents the site plan for the proposed Project.

2.1 Site Access

As shown on *Figure 2-2,* vehicular access to the Project will be provided via one (1) right-turn out only unsignalized driveway located along Tippecanoe Avenue (i.e. Project Driveway No. 1), one (1) full-egress only unsignalized driveway located along Central Avenue (i.e. Project Driveway No. 2) and one (1) full-ingress only unsignalized driveway located along Central Avenue (i.e. Project Driveway No. 3).

LINSCOTT LAW & GREENSPAN engineers

N NO SCALE

SOURCE: GOOGLE

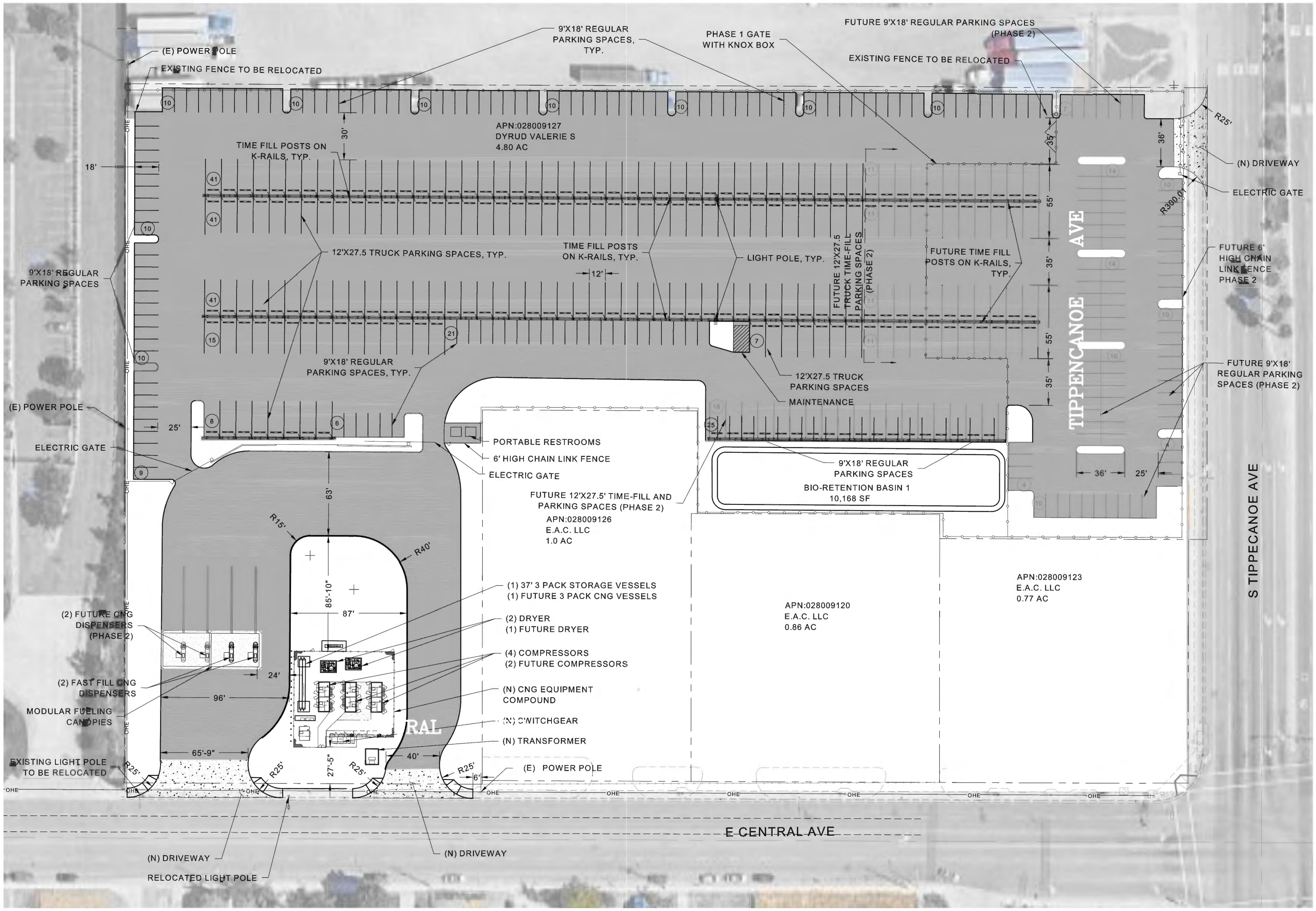
KEY

= PROJECT SITE

FIGURE 2-1

EXISTING SITE AERIAL

CNG FUELING STATION PROJECT, SAN BERNARDINO



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SOURCE: CLEAN ENERGY

LINSCOTT LAW & GREENSPAN engineers

NO SCALE

FIGURE 2–2

PROPOSED SITE PLAN

CNG FUELING STATION PROJECT, SAN BERNARDINO

3.0 ANALYSIS CONDITIONS AND METHODOLOGY

3.1 Existing Street Network

Regional access to the site is provided via the I-10 Freeway and the I-215 Freeway. The principal local network of streets serving the project includes Central Avenue and Tippecanoe Avenue. The following discussion provides a brief synopsis of these key area streets.

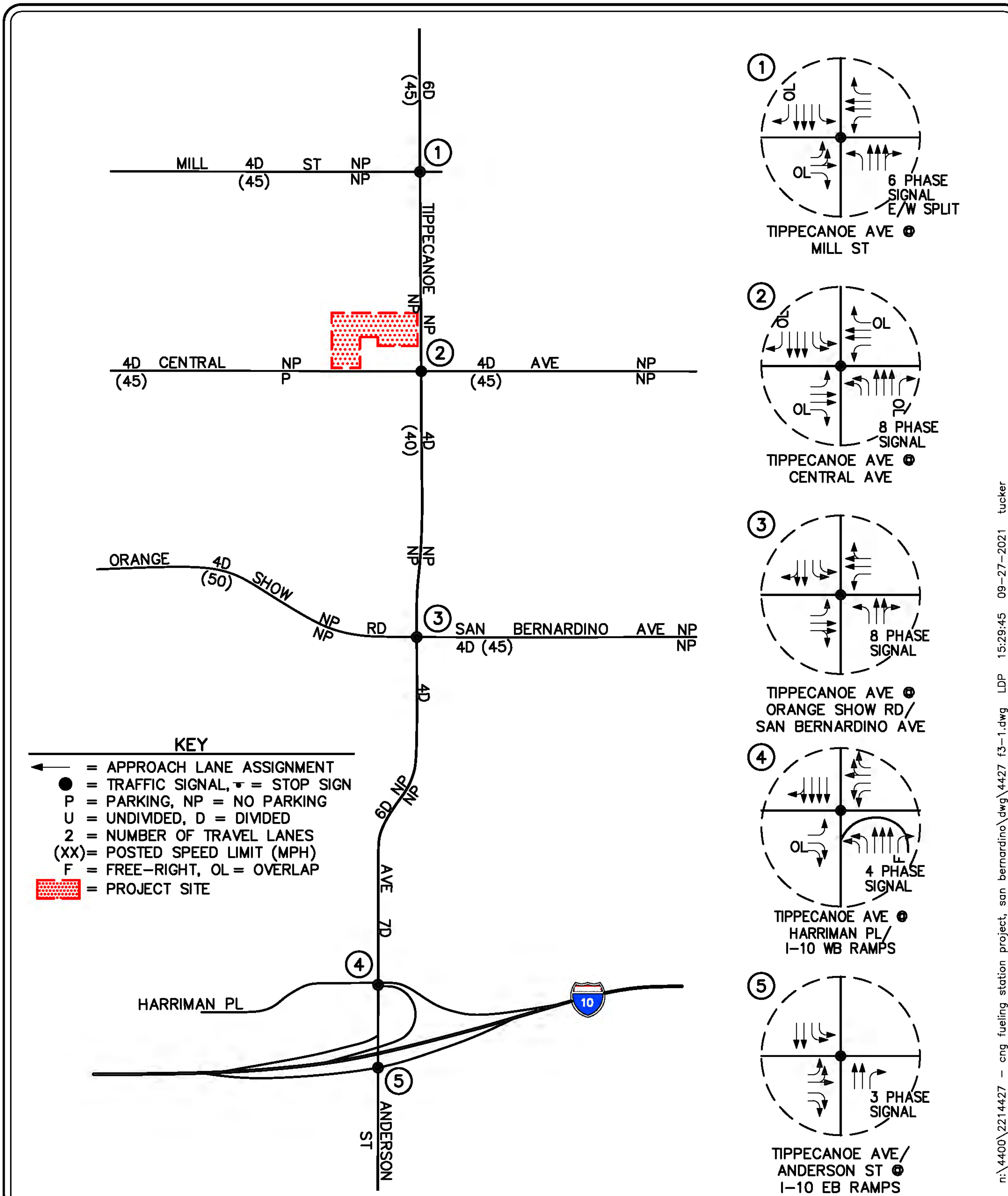
Central Avenue is a four-lane divided roadway, oriented in the east-west direction. Central Avenue borders the Project site to the south. On-street parking is not permitted along either side of the roadway east of Tippecanoe Avenue, but is permitted only along the southern side of the roadway, west of Tippecanoe Avenue. The posted speed limit on Central Avenue is 45 miles per hour (mph). A traffic signal controls the study intersection of Central Avenue at Tippecanoe Avenue.

Tippecanoe Avenue is generally a six-lane divided roadway north of Central Avenue and generally a four-lane divided roadway south of Central Avenue, oriented in the north-south direction. Tippecanoe Avenue borders a portion of the Project site to the east. On-street parking is not permitted along either side of the roadway within the vicinity of the Project site. The posted speed limit on Tippecanoe Avenue is 45 mph north of Central Avenue and 40 mph south of Central Avenue. Traffic signals control the study intersections of Tippecanoe Avenue at Mill Street, Central Avenue, Orange Show Road/San Bernardino Avenue, Harriman Place/I-10 Westbound Ramps, and I-10 Eastbound Ramps.

Figure 3-1 presents an inventory of the existing roadway conditions within the study area evaluated in this report. The number of travel lanes and intersection controls for the key area study intersections are identified. ***Figure 3-2*** shows the current City of San Bernardino General Plan Circulation Element.

3.2 Existing Traffic Volumes

Due to the COVID-19 Coronavirus Pandemic, historical counts were researched for the five (5) key study intersections evaluated in this report, but were only available for key study intersections #4 and #5. Specifically, the historical traffic counts for intersections #4 and #5 were conducted by Counts Unlimited on May 23, 2019. Due to the absence of available historical traffic count data for intersections #1, #2 and #3, traffic counts at these three (3) locations were conducted by Counts Unlimited on July 29, 2021. Given that these traffic counts were conducted during the COVID-19 Coronavirus Pandemic, the traffic counts were grown by a derived factor to establish Year 2021 existing baseline traffic conditions. Intersections #1, #2 and #3 were grown by a factor of 1.5127 during the weekday AM peak hour and by a factor of 1.2536 during the weekday PM peak hour (i.e. calculated growth factors for intersection #4 based on the COVID-19 Year 2021 counts compared to the Year 2019 historical data, which was grown at 3% per year to Year 2021). The traffic counts for intersections #4 and #5 were factored up by the City-approved growth factor of 3.0% per year to reflect current Year 2021 existing baseline traffic conditions (i.e. 6% total growth for intersections #4 and #5).



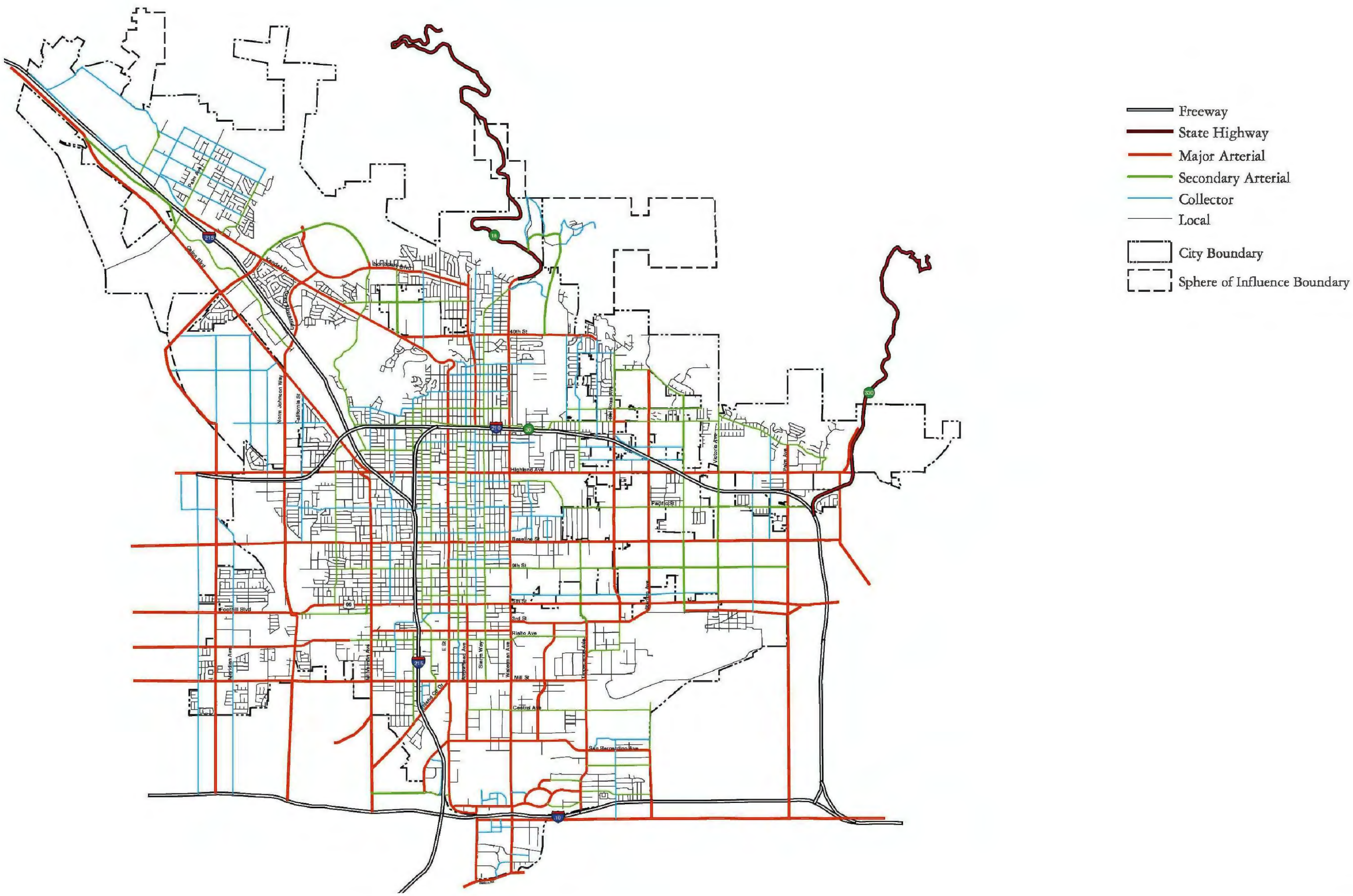
LINSCOTT LAW & GREENSPAN engineers

N NO SCALE

FIGURE 3-1

EXISTING ROADWAY CONDITIONS AND INTERSECTION CONTROLS

CNG FUELING STATION PROJECT, SAN BERNARDINO



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LINSCOTT LAW & GREENSPAN engineers

NO SCALE

SOURCE: CITY OF SAN BERNARDINO

FIGURE 3–2

CITY OF SAN BERNARDINO GENERAL PLAN CIRCULATION ELEMENT

CNG FUELING STATION PROJECT, SAN BERNARDINO

Figures 3-3 and ***3-4*** illustrate the existing AM and PM peak hour traffic volumes at the five (5) key study intersections evaluated in this report, respectively. ***Appendix B*** contains the detailed peak hour traffic count sheets for the key intersections evaluated in this report, the historical data and the growth factor calculation worksheet.

3.3 Level of Service (LOS) Analysis Methodologies

AM and PM peak hour operating conditions for the key study intersections were evaluated using the methodology outlined in *Chapter 19 of the Highway Capacity Manual 6 (HCM 6)* for signalized intersections, the methodology outlined in *Chapter 20 of the HCM 6* for two-way stop-controlled intersections and the methodology outlined in *Chapter 21 of the HCM 6* for all-way stop-controlled intersections.

3.3.1 *Highway Capacity Manual 6 (HCM 6) Method of Analysis (Signalized Intersections)*

Based on the HCM operations method of analysis, level of service for signalized intersections and approaches is defined in terms of control delay, which is a measure of the increase in travel time due to traffic signal control, driver discomfort and fuel consumption. Control delay includes the delay associated with vehicles slowing in advance of an intersection, the time spent stopped on an intersection approach, the time spent as vehicles move up in the queue and the time needed for vehicles to accelerate to their desired speed. LOS criteria for traffic signals are stated in terms of the control delay in seconds per vehicle. The LOS thresholds established for the automobile mode at a signalized intersection are shown in ***Table 3-1***.

3.3.2 *Highway Capacity Manual 6 (HCM 6) Method of Analysis (Unsignalized Intersections)*

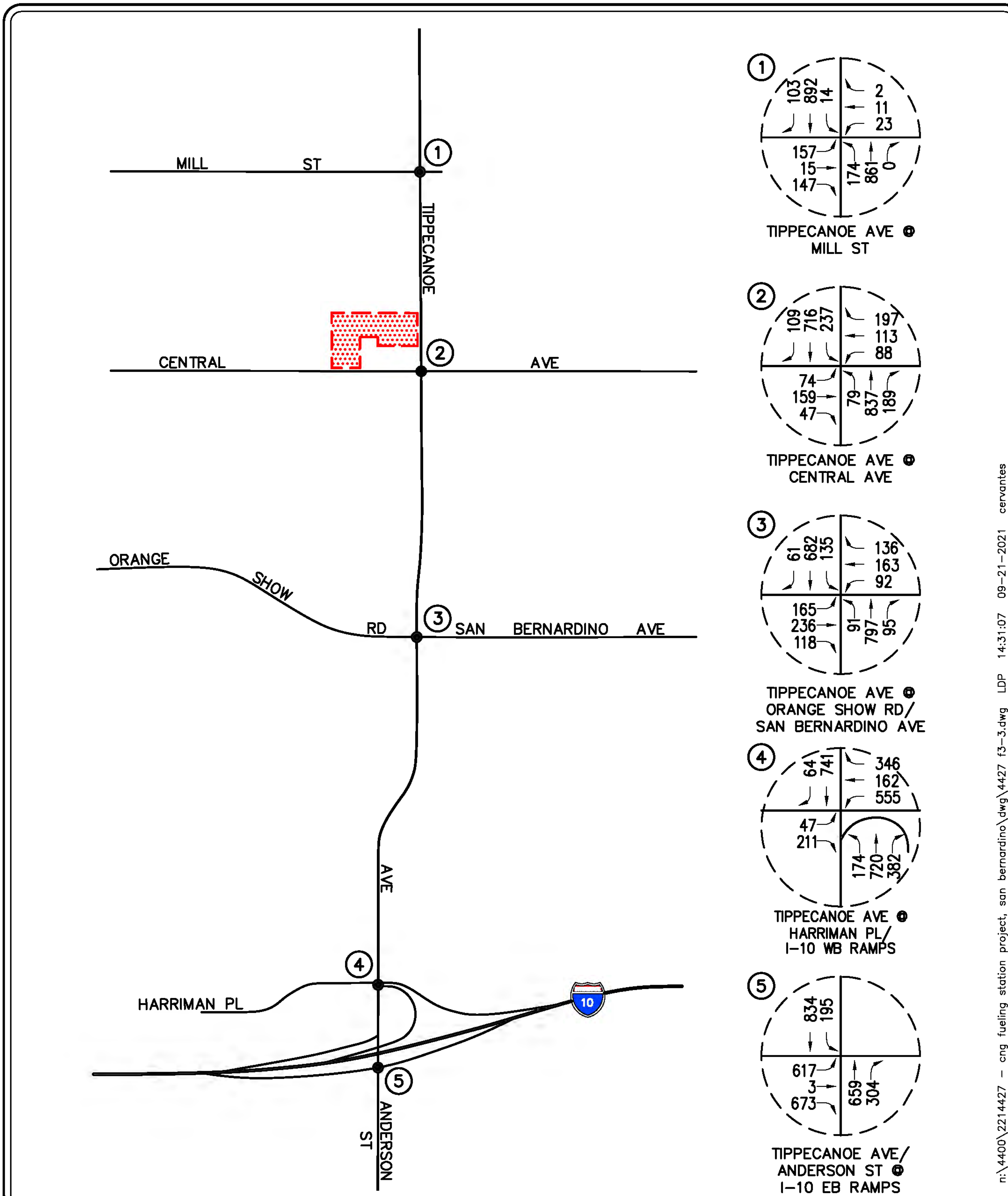
The HCM unsignalized methodology for stop-controlled intersections was utilized for the analysis of the unsignalized intersections. LOS criteria for unsignalized intersections differ from LOS criteria for signalized intersections as signalized intersections are designed for heavier traffic and therefore a greater delay. Unsignalized intersections are also associated with more uncertainty for users, as delays are less predictable, which can reduce users' delay tolerance.

3.3.2.1 Two-Way Stop-Controlled Intersections

Two-way stop-controlled intersections are comprised of a major street, which is uncontrolled and a minor street, which is controlled by stop signs. Level of service for a two-way stop-controlled intersection is determined by the computed or measured control delay. The control delay by movement, by approach and for the intersection as a whole is estimated by the computed capacity for each movement. LOS is determined for each minor-street movement (or shared movement) as well as major-street left turns. The worst side street approach delay is reported. LOS is not defined for the intersection as a whole or for major-street approaches, as it is assumed that major-street through vehicles experience zero delay. The HCM control delay value ranges for two-way stop-controlled intersections are shown in ***Table 3-2***.

3.3.2.2 All-Way Stop-Controlled Intersections

All-way stop-controlled intersections require every vehicle to stop at the intersection before proceeding. Because each driver must stop, the decision to proceed into the intersection is a function



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LINSCOTT LAW & GREENSPAN engineers

N NO SCALE

KEY

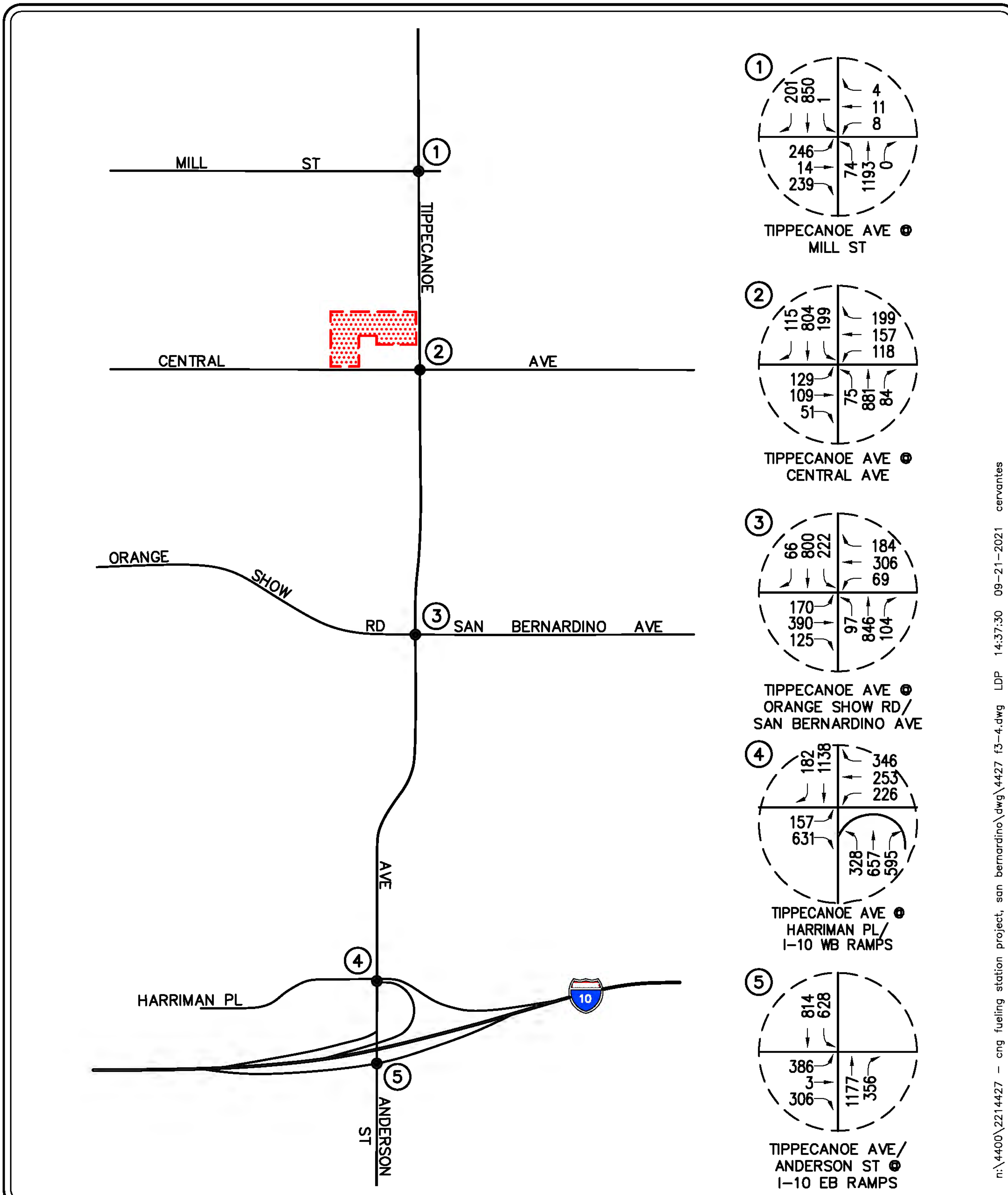
= STUDY INTERSECTION

= PROJECT SITE

FIGURE 3-3

EXISTING AM PEAK HOUR TRAFFIC VOLUMES

CNG FUELING STATION PROJECT, SAN BERNARDINO



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KEY

(#) = STUDY INTERSECTION

= PROJECT SITE

FIGURE 3-4

EXISTING PM PEAK HOUR TRAFFIC VOLUMES

CNG FUELING STATION PROJECT, SAN BERNARDINO

of traffic conditions on the other approaches. The time between subsequent vehicle departures depends on the degree of conflict that results between the vehicles and vehicles on the other approaches. This methodology determines the control delay for each lane on the approach, computes a weighted average for the whole approach and computes a weighted average for the intersection as a whole. Level of service (LOS) at the approach and intersection levels is based solely on control delay. The HCM control delay value ranges for all-way stop-controlled intersections are shown in *Table 3-2*.

3.4 Impact Criteria and Thresholds

3.4.1 *City of San Bernardino*

According to the *City of San Bernardino Traffic Impact Analysis Guidelines,* dated August 2020, LOS D is the minimum acceptable condition that should be maintained during the peak commute hours. Therefore, any intersection operating at LOS E or LOS F is considered deficient/unsatisfactory.

- For signalized intersections, traffic impacts are to be considered "significant" when any of the following changes in the volume-to-capacity (V/C) ratios occur between the "without project" and the "with project" conditions:

LOS Without Project	V/C Difference
C	> 0.0400
D	> 0.0200
E, F	> 0.0100

Given that the City of San Bernardino does not have specific impact criteria for unsignalized intersections, this report defines the following impact criteria for unsignalized intersections.

- An unsignalized intersection impact is considered to be significant if the project causes an intersection at LOS D or better to degrade to LOS E or LOS F, and the traffic signal warrant analysis determines that a traffic signal is justified.

The aforementioned criteria will be applied to key study intersections #1, #2, #3 and #4, which are located in the City of San Bernardino.

3.4.2 *City of Loma Linda*

The City of Loma Linda utilizes the County of San Bernardino's guidelines for level of service analyses. The proposed Project is located within the Valley region of San Bernardino County and therefore the following criteria as stated in the *San Bernardino County Transportation Impact Study Guidelines,* dated July 2019 has been utilized to evaluate the impacts at the one (1) key study intersection located within the City of Loma Linda (i.e. key study intersection #5).

Signalized Intersections

- Any signalized study intersection in the Valley or Mountain regions that is operating at an acceptable LOS D or better without project traffic in which the addition of project traffic causes the intersection to degrade to an LOS E or F shall identify improvements to improve operations to LOS D or better.

- Any signalized study intersection in the Valley or Mountain regions that is operating at LOS E or F without project traffic where the project increases delay by 5.0 or more seconds shall identify improvements to offset the increase in delay.

Unsignalized Intersections

Consistent with the acceptable LOS for the Desert, Valley, and Mountain regions as described in the current General Plan, the County should consider the following unsignalized intersection criteria when identifying operational deficiencies:

An operational improvement would be required if the study determines that either section a) or both sections b) and c) occur:

a) The addition of project related traffic causes the intersection to degrade from an LOS D or better to a LOS E or worse in the Valley and Mountain regions or from an LOS C or better to an LOS D or worse in the Desert region.

OR

b) The project adds 5.0 seconds or more of delay to an intersection that is already projected to operate without project traffic at an LOS E or F in the Valley and Mountain regions or at an LOS D, E, or F in the Desert region (per Section 10.5.2 b))

AND

c) One or both of the following conditions are met:

> 1) The project adds ten (10) or more trips to any minor street approach
>
> 2) The intersection meets the peak hour traffic signal warrant after the addition of project traffic (per Section 10.5.2 c)).

If the conditions above are satisfied, improvements should be identified that achieve the following:

- In the Valley and Mountain regions, improvements should be identified that would achieve LOS D or better for case a) above or to pre-project LOS and delay for case b) above.

TABLE 3-1

LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS (HCM 6 METHODOLOGY)[1]

Level of Service (LOS)	Control Delay Per Vehicle (seconds/vehicle)	Level of Service Description
A	≤ 10.0	This level of service occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
B	> 10.0 and ≤ 20.0	This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of average delay.
C	> 20.0 and ≤ 35.0	Average traffic delays. These higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.
D	> 35.0 and ≤ 55.0	Long traffic delays At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high *v/c* ratios. Many vehicles stop and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	> 55.0 and ≤ 80.0	Very long traffic delays This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths and high *v/c* ratios. Individual cycle failures are frequent occurrences.
F	≥ 80.0	Severe congestion This level, considered to be unacceptable to most drivers, often occurs with over saturation, that is, when arrival flow rates exceed the capacity of the intersection. It may also occur at high *v/c* ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing factors to such delay levels.

[1] Source: *Highway Capacity Manual 6*, Chapter 19: Signalized Intersections.

TABLE 3-2

LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS (HCM 6 METHODOLOGY)[2,3]

Level of Service (LOS)	Highway Capacity Manual (HCM) Delay Per Vehicle (seconds/vehicle)	Level of Service Description
A	≤ 10.0	Little or no delay
B	> 10.0 and ≤ 15.0	Short traffic delays
C	> 15.0 and ≤ 25.0	Average traffic delays
D	> 25.0 and ≤ 35.0	Long traffic delays
E	> 35.0 and ≤ 50.0	Very long traffic delays
F	> 50.0	Severe congestion

2 Source: *Highway Capacity Manual 6*, Chapter 20: Two-Way Stop-Controlled Intersections. The LOS criteria apply to each lane on a given approach and to each approach on the minor street. LOS is not calculated for major-street approaches or for the intersection as a whole.

3 Source: *Highway Capacity Manual 6*, Chapter 21: All-Way Stop-Controlled Intersections. For approaches and intersection-wide assessment, LOS is defined solely by control delay.

4.0 TRAFFIC FORECASTING METHODOLOGY

In order to estimate the traffic impact characteristics of the Project, a multi-step process has been utilized. The first step is traffic generation, which estimates the total arriving and departing traffic on a peak hour and daily basis. The traffic generation potential is forecast by applying the appropriate vehicle trip generation equations and/or rates to the Project development tabulation.

The second step of the forecasting process is traffic distribution, which identifies the origins and destinations of inbound and outbound Project traffic. These origins and destinations are typically based on demographics and existing/expected future travel patterns in the study area.

The third step is traffic assignment, which involves the allocation of Project traffic to study area streets and intersections. Traffic assignment is typically based on minimization of travel time, which may or may not involve the shortest route, depending on prevailing operating conditions and travel speeds.

Traffic distribution patterns are indicated by general percentage orientation, while traffic assignment allocates specific volume forecasts to individual roadway segments and intersection turning movements throughout the study area.

With the forecasting process complete and Project traffic assignments developed, the impact of the Project is isolated by comparing operational (LOS) conditions at selected key intersections using expected future traffic volumes with and without forecast Project traffic. If necessary, the need for site-specific and/or cumulative local area improvements can then be evaluated.

5.0 PROJECT TRAFFIC CHARACTERISTICS

Traffic generation is expressed in vehicle trip ends, defined as one-way vehicular movements, either entering or exiting the generating land use. Generation equations and/or rates used in the traffic forecasting procedure are typically found in the 10th Edition of *Trip Generation*, published by the Institute of Transportation Engineers (ITE) [Washington D.C., 2017]. The trip generation potential of the fast fill CNG dispensers portion of the proposed Project have been estimated using ITE Land Use 944: Gasoline Service Station trip rates. Since trip generation rates for the time fill posts portion of the proposed Project are not specifically contained within the ITE *Trip Generation* manual, the trip generation potential of this project component was estimated based on the proposed operations, as provided by the applicant, which are described in further detail below.

<u>Time Fill Posts Operations</u>

- 215 trucks will enter the site between 5:00 PM – 9:00 PM. This results in an average of 54 trucks per hour entering the site over the 4-hour period.
- After the truck is parked in the time fill post parking space, the truck driver will leave the site in a passenger vehicle. This results in an average of 54 passenger vehicles per hour leaving the site over the 4-hour period.
- During the truck rollout in the morning (i.e. between 5:00 AM – 10:00 AM), on average, 43 passenger vehicles will enter the site and 43 trucks will exit the site over the 5-hour period.

Table 5-1 summarizes the traffic generation forecast for the time fill posts portion of the proposed Project for a typical weekday based on the aforementioned project operations. Column one (1) presents the trips for passenger vehicles associated with trucks and column two (2) presents the truck trips. Column three (3) converts the truck trips to passenger car equivalents (PCE) utilizing a factor of 1.5 for trucks. Column four (4) presents the total vehicle trips (i.e. the sum of column one and column three). As shown at the bottom of *Table 5-1,* the time fill posts portion of the proposed Project is forecast to generate 1,081 PCE daily trips, with 108 PCE trips (43 inbound, 65 outbound) produced in the AM peak hour and 136 PCE trips (82 inbound, 54 outbound) produced in the PM peak hour on a “typical” weekday. It should be noted that the time fill posts portion of the proposed Project, as footnoted in *Table 5-1*, is forecast to generate 860 vehicle (Non PCE) daily trips, with 86 vehicle (Non PCE) trips produced in the AM peak hour and 108 vehicle (Non PCE) trips produced in the PM peak hour on a “typical” weekday.

5.1 Proposed Project Trip Generation Forecast

Table 5-2 summarizes the trip generation rates used in forecasting the vehicular trips generated by the proposed Project and presents the forecast daily and peak hour project traffic volumes for a “typical” weekday. As shown in the upper portion of *Table 5-2,* the trip generation potential of the fast fill CNG dispensers portion of the proposed Project have been estimated using ITE Land Use 944: Gasoline Service Station trip rates. Additionally, the trip generation potential of the time fill posts portion of the proposed Project have been estimated based on the proposed operations presented previously in *Table 5-1*.

As shown at the bottom of *Table 5-2,* the proposed Project, inclusive of both the fast fill dispensers and the time fill posts, is forecast to generate 1,597 PCE daily trips, with 139 PCE trips (59 inbound, 80 outbound) produced in the AM peak hour and 178 PCE trips (103 inbound, 75 outbound) produced in the PM peak hour on a "typical" weekday.

It should be noted that the aforementioned overall Project trip generation includes adjustments for pass-by per the *Trip Generation Handbook, 3rd Edition*, published by ITE (2014), to account for trips that are already in the everyday traffic stream on the adjoining streets (i.e. Central Avenue and Tippecanoe Avenue) and will stop as they pass by the Project site as a matter of convenience on their path to another destination. Per the *Trip Generation Handbook,* a pass-by reduction factor of 58% and 42% is recommended for the AM and PM peak hours, respectively, for the Gasoline Service Station land use. However, to provide a conservative analysis, a 25% pass-by percentage has been assumed for daily, AM peak hour, and PM peak hour traffic for the fast fill CNG dispensers portion of the proposed Project.

5.2 Project Trip Distribution and Assignment

The Project directional trip distribution pattern is presented in ***Figure 5-1***. Project traffic volumes both entering and exiting the site have been distributed and assigned to the adjacent street system based on the following considerations:

- the site's proximity to major traffic carriers (i.e. Tippecanoe Avenue, Central Avenue, etc.),
- expected localized traffic flow patterns based on adjacent street channelization and presence of traffic signals; and
- ingress/egress availability at the Project site.

It should be noted that the Project trip distribution pattern was submitted to City staff for their review and approval prior to proceeding with further analyses.

The anticipated AM and PM peak hour Project traffic volumes at the five (5) key study intersections are presented in ***Figures 5-2*** and ***5-3***, respectively. The traffic volume assignments presented in the above-mentioned figures reflect the Project trip distribution characteristics shown in *Figure 5-1* and the Project trip generation forecast presented in *Table 5-2*.

TABLE 5-1
PROJECT TRAFFIC GENERATION FORECAST – PROPOSED OPERATIONS FOR TIME FILL POSTS[4]

Time of Day	(1) Passenger Vehicles Associated with Trucks		(2) Trucks		(3) Trucks (PCE = 1.5)		(4) Total Vehicle Trips (1) + (3)		
	In	Out	In	Out	In	Out	In	Out	Total
5:00 AM	22	0	0	22	0	33	22	33	55
5:30 AM	21	0	0	21	0	32	21	32	53
6:00 AM	22	0	0	22	0	33	22	33	55
6:30 AM	21	0	0	21	0	32	21	32	53
7:00 AM	22	0	0	22	0	33	22	33	55
7:30 AM	21	0	0	21	0	32	21	32	53
8:00 AM	***22***	***0***	***0***	***22***	***0***	***33***	***22***	***33***	***55***
8:30 AM	***21***	***0***	***0***	***21***	***0***	***32***	***21***	***32***	***53***
9:00 AM	22	0	0	22	0	33	22	33	55
9:30 AM	21	0	0	21	0	32	21	32	53
10:00 AM	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0
1:00 PM	0	0	0	0	0	0	0	0	0
1:30 PM	0	0	0	0	0	0	0	0	0
2:00 PM	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0
5:00 PM	***0***	***27***	***27***	***0***	***41***	***0***	***41***	***27***	***68***
5:30 PM	***0***	***27***	***27***	***0***	***41***	***0***	***41***	***27***	***68***
6:00 PM	0	27	27	0	41	0	41	27	68
6:30 PM	0	27	27	0	41	0	41	27	68
7:00 PM	0	27	27	0	41	0	41	27	68
7:30 PM	0	27	27	0	41	0	41	27	68
8:00 PM	0	27	27	0	41	0	41	27	68
8:30 PM	0	26	26	0	39	0	39	26	65
9:00 PM	0	0	0	0	0	0	0	0	0
CNG Fueling Station Project (Time Fill Posts) Trip Generation Forecast					**Daily (PCE)**		**1,081**[5]		
					AM Peak Hour (PCE)		**43**	**65**	**108**
					PM Peak Hour (PCE)		**82**	**54**	**136**

4 Source: based on the proposed operations for the 215 time fill posts provided by the project applicant, which consists of the following.

- 215 trucks will enter the site between 5:00 PM – 9:00 PM. This results in an average of 54 trucks per hour entering the site over the 4-hour period. After the truck is parked in the time fill post parking space, the truck driver will leave the site in a passenger vehicle. This results in an average of 54 passenger vehicles per hour leaving the site over the 4-hour period. During the truck rollout in the morning (i.e. between 5:00 AM – 10:00 AM), on average, 43 passenger vehicles will enter the site and 43 trucks will exit the site over the 5-hour period.

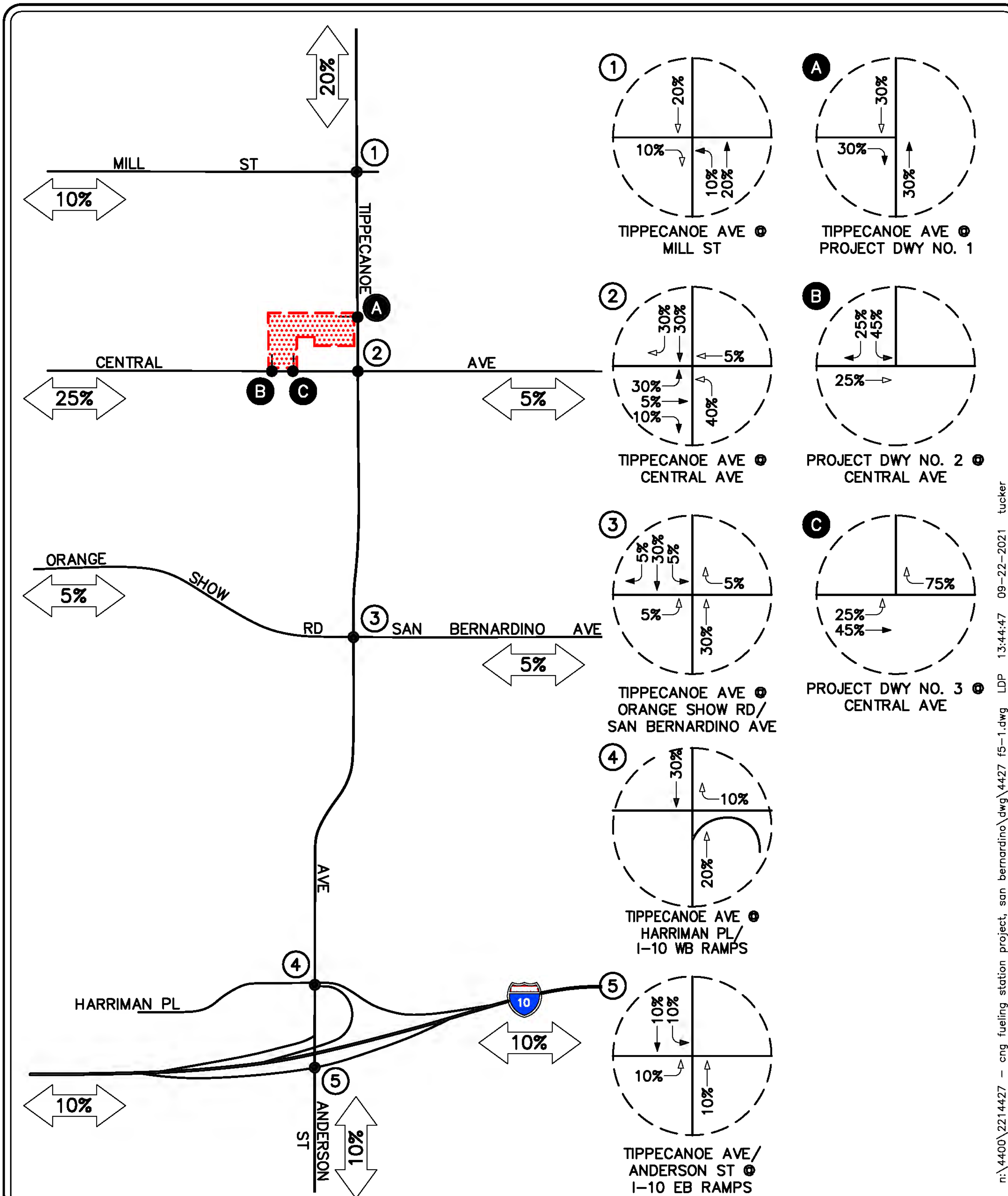
5 It should be noted that the vehicle trips (Non PCE) are 860 daily, 86 AM peak hour and 108 PM peak hour.

TABLE 5-2
PROJECT TRAFFIC GENERATION RATES AND FORECAST

ITE Land Use Code / Project Description	Daily	AM Peak Hour			PM Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total
Generation Rates:							
▪ 944: Gasoline/Service Station (TE/VFP)[6]	172.01	50%	50%	10.28	50%	50%	14.03
▪ Time Fill Posts[7]	--	--	--	--	--	--	--
CNG Fueling Station Project Generation Forecasts:							
▪ Fast Fill CNG Dispensers (4 VFP)	688	21	20	41	28	28	56
Pass-By (Daily: 25%, AM: 25%, PM: 25%)[8]	-172	-5	-5	-10	-7	-7	-14
[A] Subtotal	***516***	***16***	***15***	***31***	***21***	***21***	***42***
▪ ***[B] Time Fill Posts (215 Spaces)***	***1,081***	***43***	***65***	***108***	***82***	***54***	***136***
Total Net Proposed Project Trip Generation [A] + [B]	**1,597**	**59**	**80**	**139**	**103**	**75**	**178**

Notes:
▪ TE/VFP = Trip end per vehicle fueling position

6 Source: *Trip Generation, 10th Edition*, Institute of Transportation Engineers, (ITE) [Washington, D.C. (2017)].
7 Source: based on the proposed operations provided by the project applicant (see *Table 5-1*).
8 A pass-by reduction of 25% was assumed for daily traffic, AM peak hour traffic and PM peak hour traffic for the fast fill CNG dispensers.



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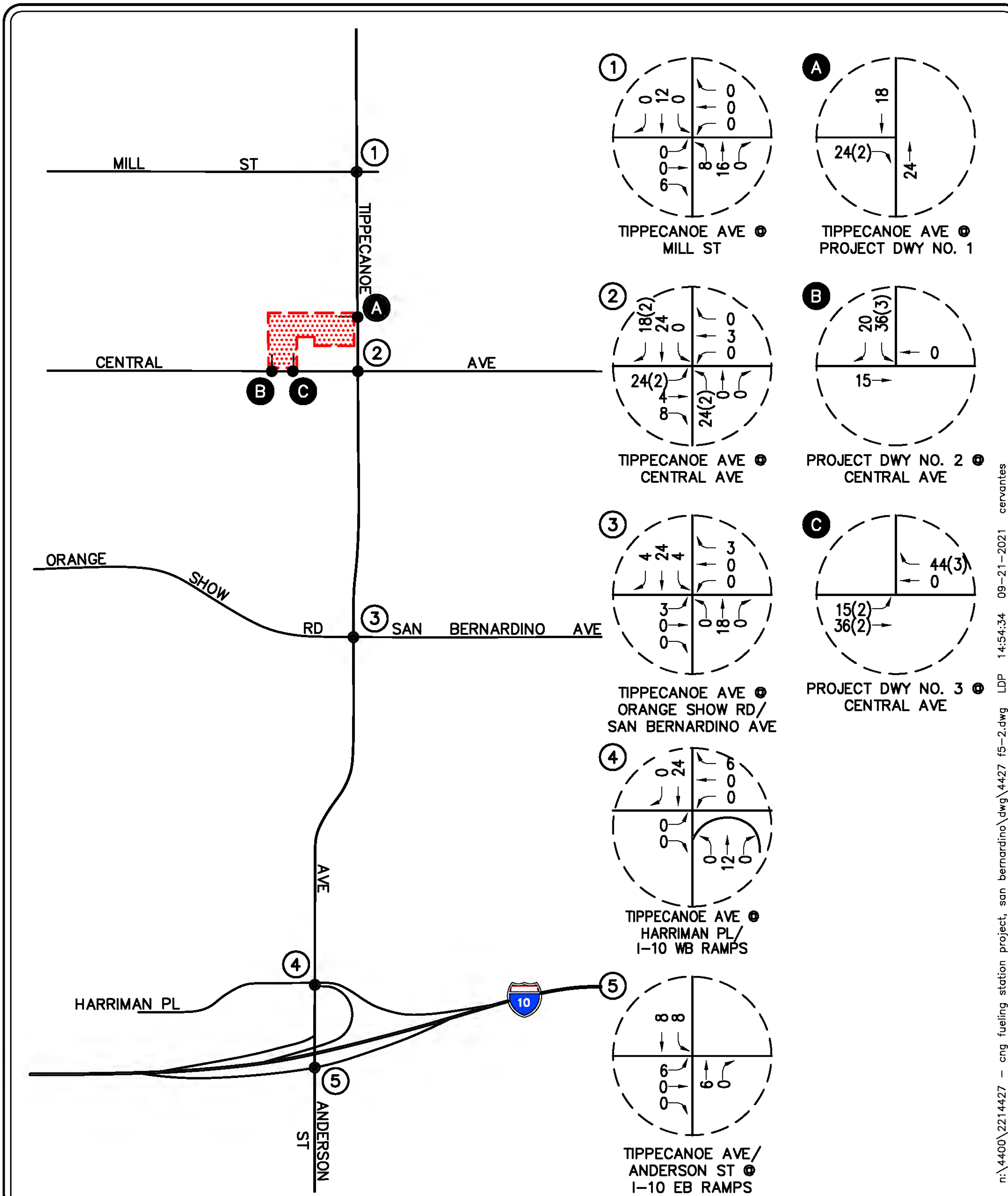
NO SCALE

KEY
(#) = STUDY INTERSECTION
= INBOUND PERCENTAGE
= OUTBOUND PERCENTAGE
= PROJECT SITE

FIGURE 5-1

PROJECT TRAFFIC DISTRIBUTION PATTERN

CNG FUELING STATION PROJECT, SAN BERNARDINO



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NO SCALE

KEY

(#) = STUDY INTERSECTION

XX(XX) = PROJECT TRIPS (PASS-BY TRIPS)

= PROJECT SITE

FIGURE 5-2

AM PEAK HOUR PROJECT TRAFFIC VOLUMES

CNG FUELING STATION PROJECT, SAN BERNARDINO

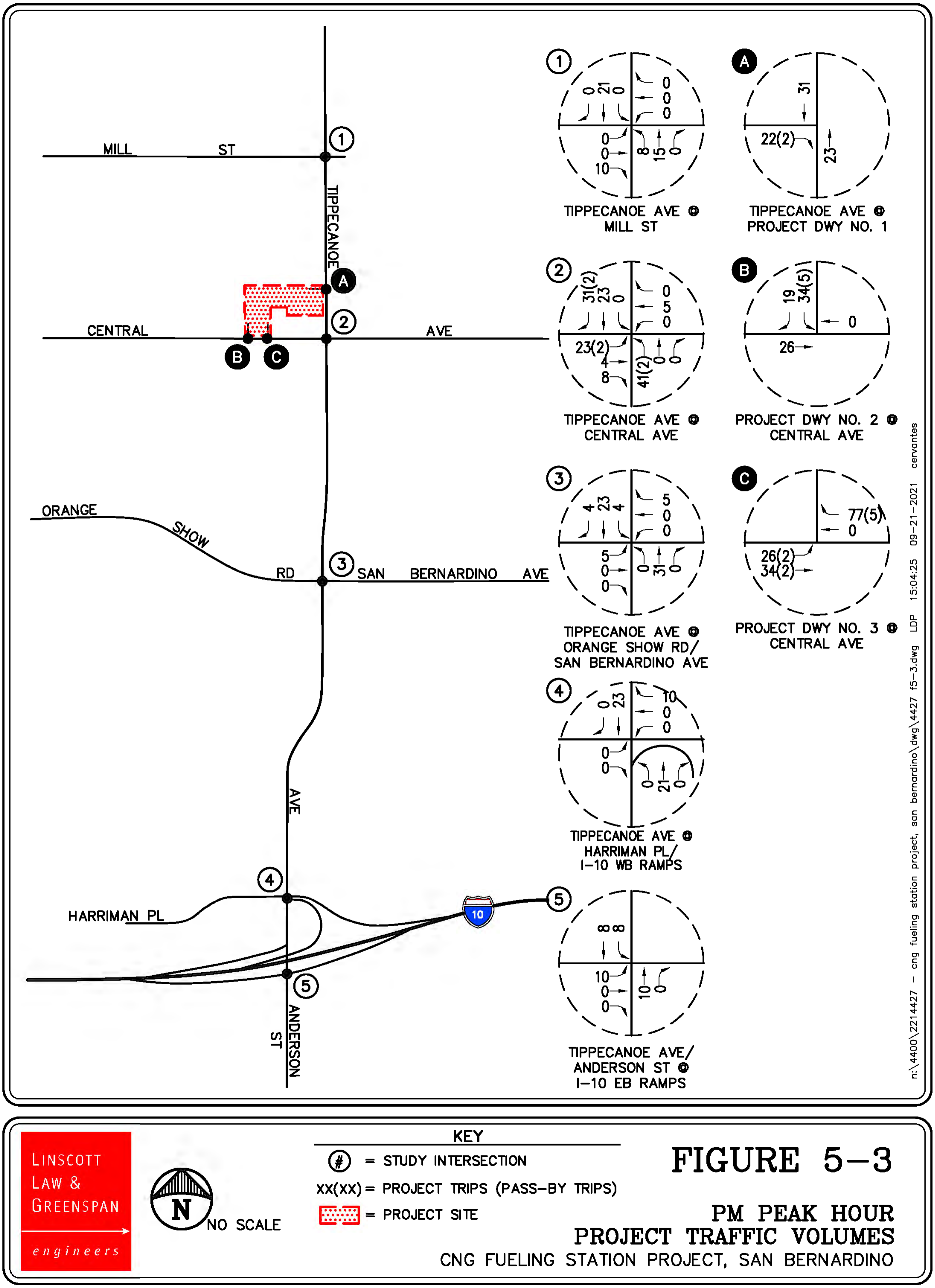


FIGURE 5-3

PM PEAK HOUR PROJECT TRAFFIC VOLUMES

CNG FUELING STATION PROJECT, SAN BERNARDINO

6.0 FUTURE TRAFFIC CONDITIONS

6.1 Existing With Project Traffic Volumes

The estimates of Project generated traffic volumes were added to the Existing traffic conditions to develop traffic projections for Existing With Project traffic conditions. ***Figures 6-1*** and ***6-2*** present the anticipated AM and PM peak hour Existing With Project traffic volumes, respectively, at the five (5) key study intersections.

6.2 Year 2023 Without Project Traffic Volumes

6.2.1 *Ambient Growth Traffic*

Near-term horizon year, traffic growth estimates have been calculated using an ambient growth factor. The ambient growth factor is intended to include unknown and future cumulative projects in the study area, as well as account for regular growth in traffic volumes due to the development of projects outside the study area. The application of the three percent (3.0%) annual growth rate to baseline traffic volumes results in a six percent (6.0%) growth in existing baseline volumes at the five (5) key study intersections to horizon Year 2023.

6.2.2 *Cumulative Projects Traffic*

In order to make a realistic estimate of future on-street conditions prior to implementation of the proposed Project, the status of other known development projects (cumulative projects) in the vicinity of the proposed Project has been researched at the Cities of San Bernardino, Loma Linda, Redlands and Highland. With this information, the potential impact of the proposed Project can be evaluated within the context of the cumulative impact of all ongoing development. Based on our research, there are eleven (11) cumulative projects in the City of San Bernardino, eight (8) cumulative projects in the City of Loma Linda, one (1) cumulative project in the City of Redlands and one (1) cumulative project in the City of Highland within the vicinity of the Project site. These twenty-one (21) planned and/or approved cumulative projects have been included as part of the cumulative background setting. The locations of the twenty-one (21) cumulative projects are presented in ***Figure 6-3***.

Table 6-1 presents the jurisdiction, description and development totals for each of the twenty-one (21) cumulative projects. ***Table 6-2*** presents the resultant trip generation for the twenty-one (21) cumulative projects. As shown in *Table 6-2*, the twenty-one (21) cumulative projects are expected to generate 42,028 daily trips (one half arriving, one half departing), with 4,259 trips (2,406 inbound and 1,853 outbound) forecast during the AM peak hour and 3,200 trips (1,441 inbound and 1,759 outbound) forecast during the PM peak hour on a “typical” weekday.

The anticipated AM and PM peak hour cumulative projects traffic volumes at the five (5) key study intersections are presented in ***Figures 6-4*** and ***6-5***, respectively.

Figures 6-6 and ***6-7*** present Year 2023 Without Project AM and PM peak hour traffic volumes at the five (5) key study intersections, respectively. It should be noted that the Year 2023 Without

Project traffic volumes include ambient traffic growth as well as the traffic from the twenty-one (21) cumulative projects.

It should again be emphasized that because this traffic impact analysis utilizes both an ambient growth factor along with a list of cumulative projects approach to analyze cumulative impacts, this traffic impact analysis is highly conservative and would tend to overstate cumulative traffic impacts.

6.3 Year 2023 With Project Traffic Volumes

The estimates of Project generated traffic volumes were added to the Year 2023 Without Project traffic conditions to develop traffic projections for Year 2023 With Project traffic conditions. ***Figures 6-8*** and ***6-9*** present the anticipated AM and PM peak hour Year 2023 With Project traffic volumes at the five (5) key study intersections, respectively.

TABLE 6-1
LOCATION AND DESCRIPTION OF CUMULATIVE PROJECTS[9]

No.	Description	Location/Address	Size
City of San Bernardino			
1.	CUP 18-05 / PCNL 18-04	NWC of E. Central Avenue and S. Tippecanoe Avenue	1,900 SF Retail 1,200 SF Fast Food Rest. without Drive-Thru 2,550 SF Fast Food Rest. with Drive-Thru 20 VFP Gas Station 12 VFP Gas Station Diesel 3,800 SF Convenience Store 140' Tunnel Express Carwash
2.	CUP 18-17	SWC of E. Mill St & S. Waterman Ave	24,630 SF Truck Storage & Service Facility (8 Acres)
3.	CUP 18-21	1150 and 1250 S. Tippecanoe Avenue	Increased Daily Tonnage (900 Tons to 1,500 Tons)
4.	CUP 17-09 / CUP 17-29 / PCNL 18-03	1195 S. Waterman Avenue	12 VFP Gas Station 3 VFP Diesel Truck Fueling Station 3,806 SF Convenience Store
5.	GPA 19-03 / DCA 19-08 / Subdivision 19-16 / DP Type-D 19-13	SEC of S. Foisy St and E. Central Ave	467,280 SF Warehouse
6.	Subdivision 17-09 / DP Type-D 17-15	SEC of E. Central Ave and S. Lena Rd	135,500 SF Warehouse
7.	Subdivision 18-04 / Subdivision 18-05 / DP Type-D 18-04	SEC of S. Washington Avenue and E. Central Avenue	287,184 SF Warehouse *(107,600 SF Building 1 & 179,584 SF Building 2)*
8.	Subdivision 18-06 / Subdivision 18-07 / DP Type-D 18-05	SWC of S. Washington Avenue and E. Central Avenue	287,800 SF Warehouse *(141,000 SF Building 1 & 146,800 SF Building 2)*
9.	Subdivision 20-05 / CUP 20-13	SEC of W. Redlands Boulevard and S. Hunts Lane	12 VFP Gas Station 4,650 SF Convenience Store 5,000 SF Fast Food Rest. with Drive-Thru
10.	Chick-fil-A San Bernardino Project	1050 Harriman Place	4,562 SF Chick-fil-A with Drive-Thru
11.	GPA 19-01 / DCA 19-05 / Subdivision 19-03 / CUP 19-10	230 S. Waterman Avenue	100 Student Private School (K-8) 714 Student Private School (K-12)
City of Loma Linda			
12.	Candlewood Suites Hotel	Richardson Street & Redlands Boulevard	91-Room Hotel
13.	California Eye Care Center	25258 Redlands Boulevard	30,382 SF Eye Care Center
14.	Lewis's 57 Condo Units	SWC of Redlands Blvd & Bryn Mawr	57 DU Multifamily

9 Source: Cities of San Bernardino, Loma Linda, Redlands and Highland Planning Department staff.

TABLE 6-1 (CONTINUED)
LOCATION AND DESCRIPTION OF CUMULATIVE PROJECTS[10]

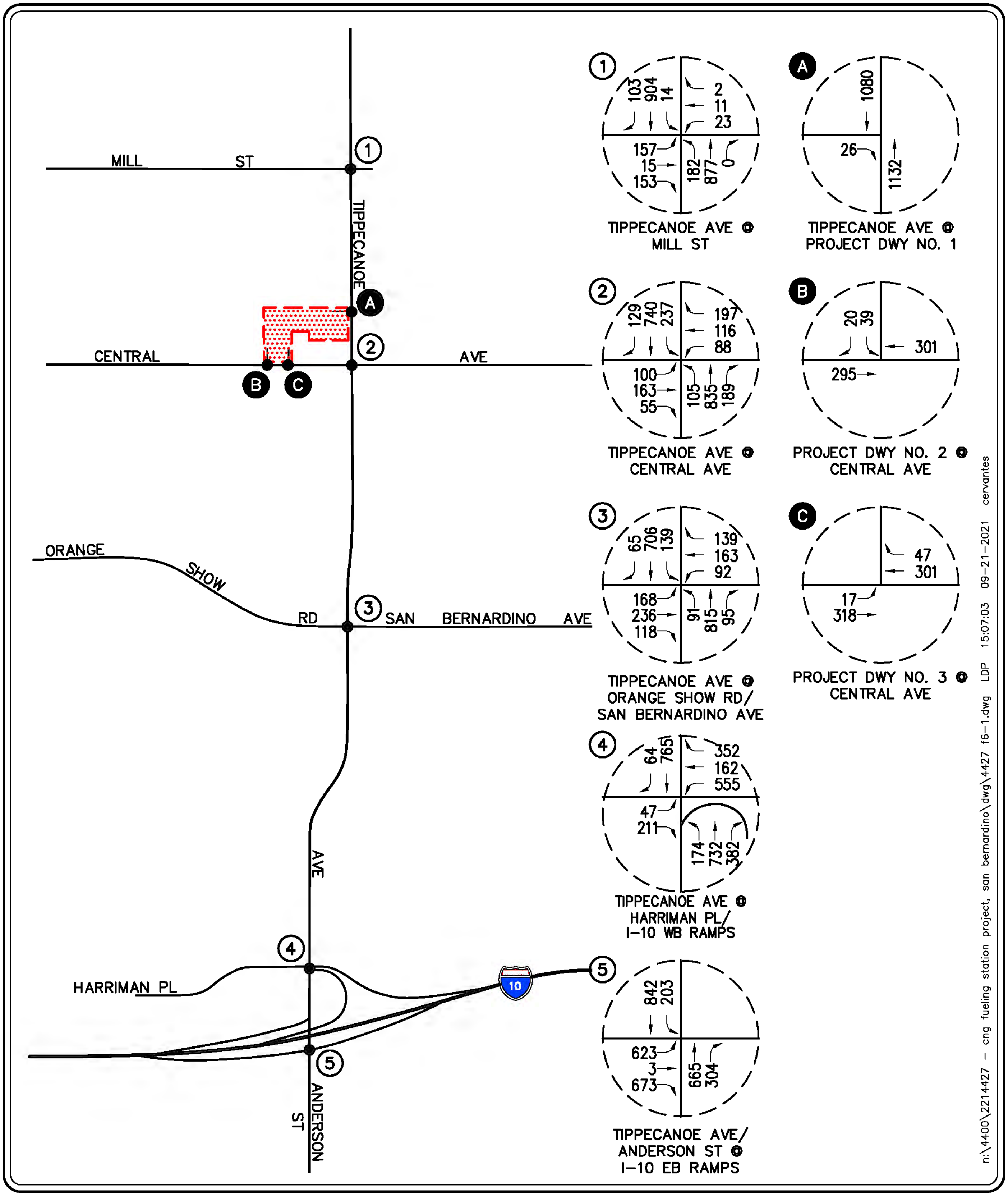
No.	Description	Location/Address	Size
15.	Courtyard Marriot Hotel	10372 Richardson Street	125-Room Hotel
16.	O'Reilly's Auto Parts	25630 Redlands Boulevard	7,564 SF O'Reilly Auto Parts Store
17.	Redlands Boulevard Motel	24850 Redlands Boulevard	23-Room Motel
18.	Cottage Street Residential	25239 Cottage Street	23 DU Multifamily
19.	CA Highway Patrol Facility	Bryn Mawr & Redlands Boulevard	39,285 SF Patrol Facility
City of Redlands			
20.	Planned Development No. 4	NEC of Mountain View Ave & Interstate 10	420,000 SF Warehousing
City of Highland			
21.	Sterling Natural Resource Center	NWC of 5th Street at Del Rosa Drive	12,500 SF Administration Center

[10] Source: Cities of San Bernardino, Loma Linda, Redlands and Highland Planning Department staff.

TABLE 6-2
CUMULATIVE PROJECTS TRAFFIC GENERATION FORECAST[11]

No.	Cumulative Project Description	Daily Two-Way	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
1.	CUP 18-05 / PCNL 18-04[12]	13,398	541	533	1,074	610	605	1,215
2.	CUP 18-17[13]	1,310	16	27	43	41	23	64
3.	CUP 18-21[14]	1,076	39	39	78	83	83	166
4.	CUP 17-09/CUP 17-29/PCNL 18-03[15]	3,251	68	68	136	96	96	192
5.	GPA 19-03/DCA 19-08/Subdivision 19-16/DP Type-D 19-13[16]	1,098	83	24	107	33	88	121
6.	Subdivision 17-09/DP Type-D 17-15[17]	324	22	13	35	11	29	40
7.	Subdivision 18-04/Subdivision 18-05/DP Type-D 18-04[18]	1,379	92	24	116	32	94	126
8.	Subdivision 18-06/Subdivision 18-07/DP Type-D 18-05[19]	1,384	92	24	116	32	94	126
9.	Subdivision 20-05 / CUP 20-13[20]	5,649	125	123	248	113	109	222
10.	Chick-fil-A San Bernardino Project	1,611	47	46	93	38	36	74
11.	GPA 19-01/DCA 19-05/Subdivision 19-03/CUP 19-10[21]	5,906	967	779	1,746	173	210	383
12.	Candlewood Suites Hotel	761	25	18	43	28	27	55
13.	California Eye Care Center	1,057	66	18	84	29	76	105
14.	Lewis's 57 Condo Units	417	6	20	26	20	12	32
15.	Courtyard Marriot Hotel	1,045	35	24	59	38	37	75
16.	O'Reilly's Auto Parts	377	10	8	18	10	11	21
17.	Redlands Boulevard Motel	77	3	6	9	5	4	9
18.	Cottage Street Residential	168	3	8	11	8	5	13
19.	CA Highway Patrol Facility	887	98	33	131	17	50	67
20.	Planned Development No. 4	731	55	16	71	22	58	80
21.	Sterling Natural Resource Center	122	13	2	15	2	12	14
Total Cumulative Projects Trip Generation Forecast		**42,028**	**2,406**	**1,853**	**4,259**	**1,441**	**1,759**	**3,200**

11 Unless otherwise noted, Source: *Trip Generation, 10th Editions*, Institute of Transportation Engineers (ITE) [Washington, D.C. (2017)].
12 Source: *Fuel Center and Convenience Store Traffic Impact Analysis*, prepared by Urban Crossroads, dated October 3, 2018.
13 Source: *Waterman & Mill Truck Repair Facility TIA Scope of Study Form*, prepared by Urban Crossroads, dated January 2, 2019.
14 Source: *East Valley Recycling Center Expansion Traffic Impact Analysis*, prepared by Urban Crossroads, dated July 29, 2019.
15 Source: *Proposed Waterman Ave/Orange Show Rd Gas Station Project TIS,* prepared by RK Engineering Group, Inc., dated Feb. 20, 2018.
16 Source: *Foisy East Warehouse Traffic Impact Study*, prepared by Kimley Horn, dated June 2020.
17 Source: *Valley View Avenue Warehouse Scope of Study Form,* prepared by Translutions Inc, dated December 7, 2017.
18 Source: *Washington Commerce Center East Traffic Impact Study*, prepared by Kimley Horn, dated July 2018.
19 Source: *Washington Commerce Center West Traffic Impact Study*, prepared by Kimley Horn, dated July 2018.
20 Source: *TIS for the Proposed SEC of Hunts and Redlands Retail Project*, prepared by Kimley Horn, dated November 2020.
21 Source: *Norton Science and Language Academy Traffic Impact Study*, prepared by Kimley Horn, dated November 2019.



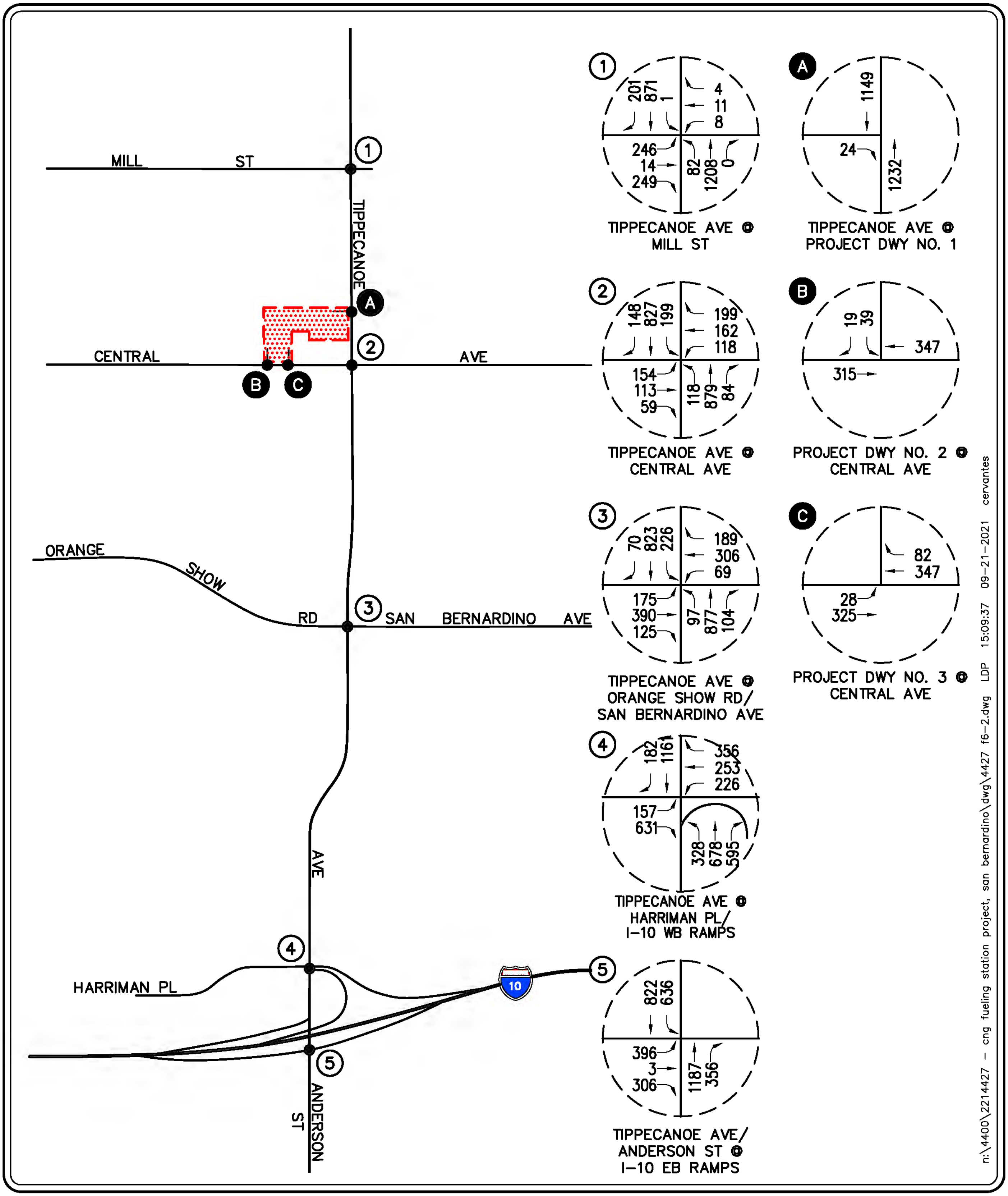
LINSCOTT LAW & GREENSPAN engineers

N NO SCALE

KEY
(#) = STUDY INTERSECTION
= PROJECT SITE

FIGURE 6-1

EXISTING WITH PROJECT
AM PEAK HOUR TRAFFIC VOLUMES
CNG FUELING STATION PROJECT, SAN BERNARDINO



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N NO SCALE

KEY

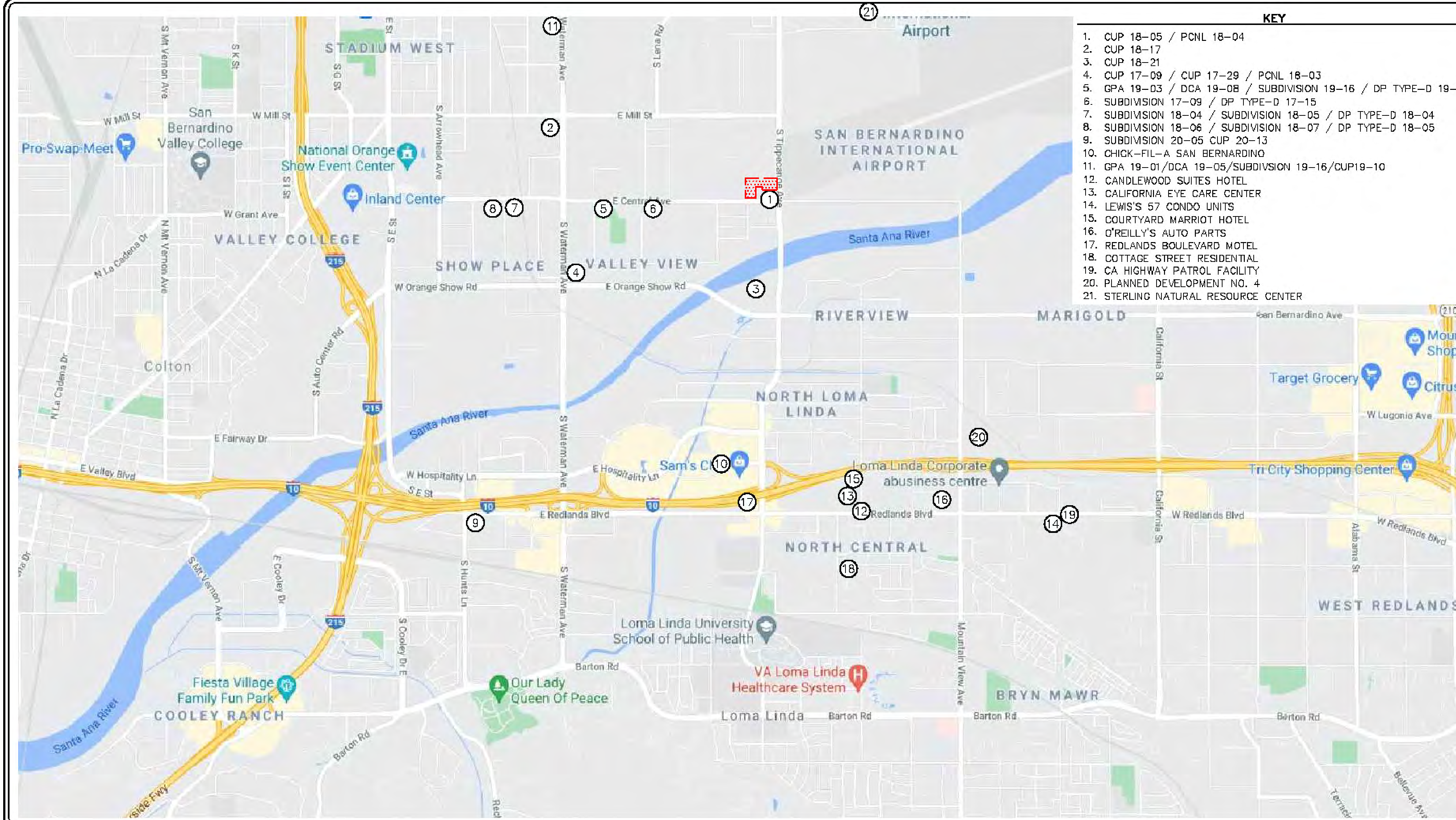
(#) = STUDY INTERSECTION

= PROJECT SITE

FIGURE 6–2

EXISTING WITH PROJECT PM PEAK HOUR TRAFFIC VOLUMES

CNG FUELING STATION PROJECT, SAN BERNARDINO



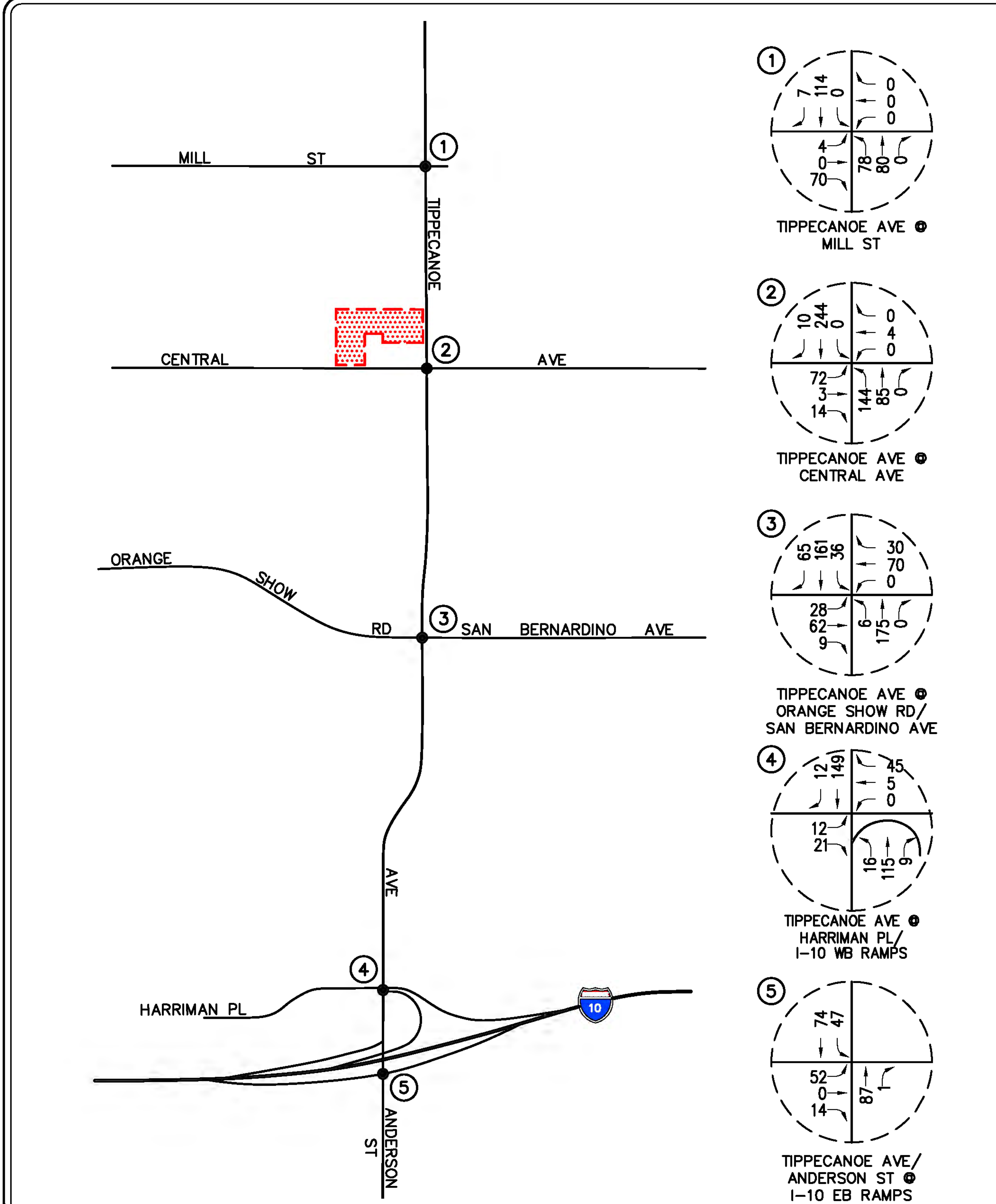
NO SCALE

KEY
(#) = CUMULATIVE PROJECT LOCATION
= PROJECT SITE

FIGURE 6–3

LOCATION OF CUMULATIVE PROJECTS

CNG FUELING STATION PROJECT, SAN BERNARDINO



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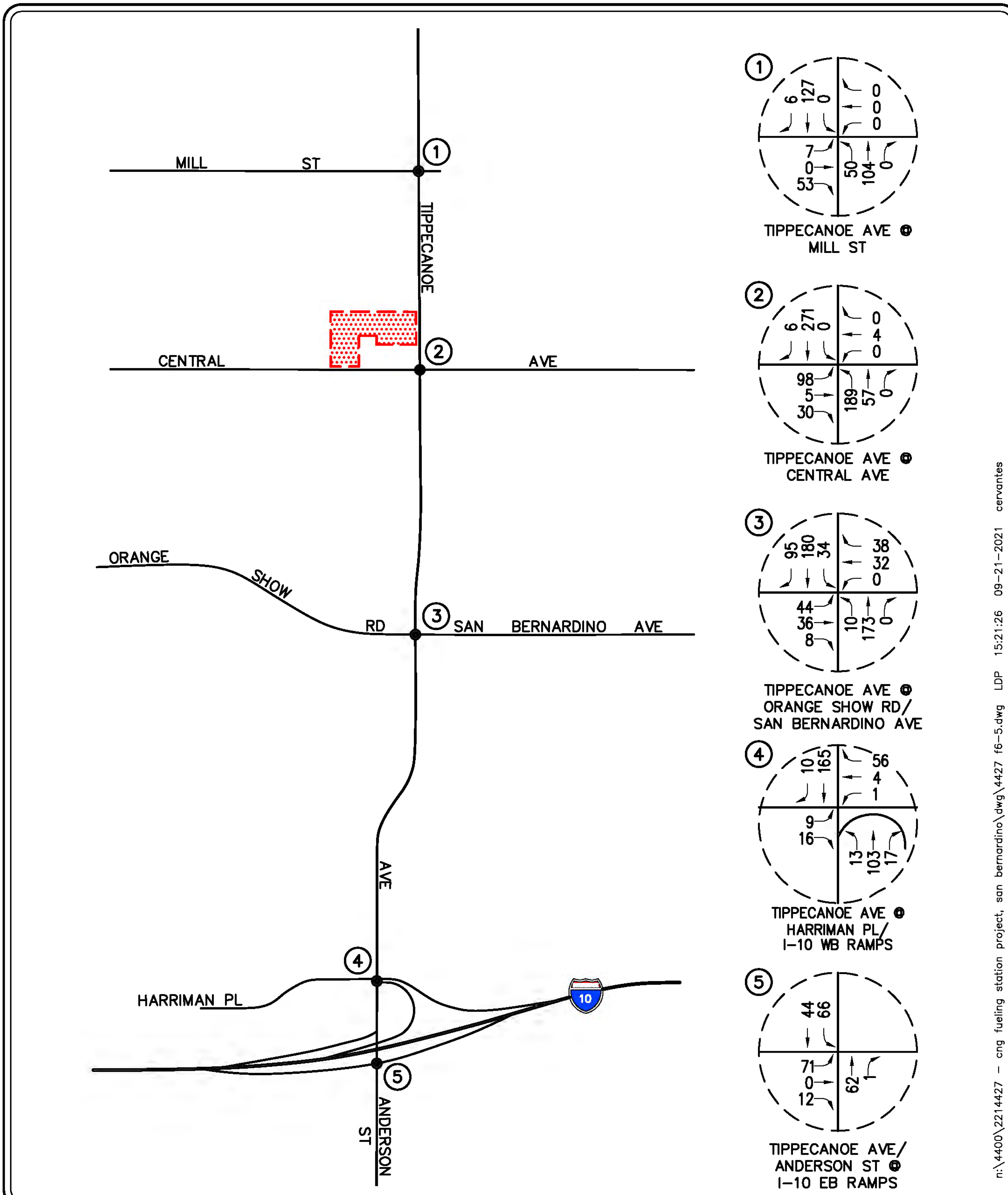
N NO SCALE

KEY
(#) = STUDY INTERSECTION
= PROJECT SITE

FIGURE 6-4

AM PEAK HOUR
CUMULATIVE PROJECTS TRAFFIC VOLUMES
CNG FUELING STATION PROJECT, SAN BERNARDINO



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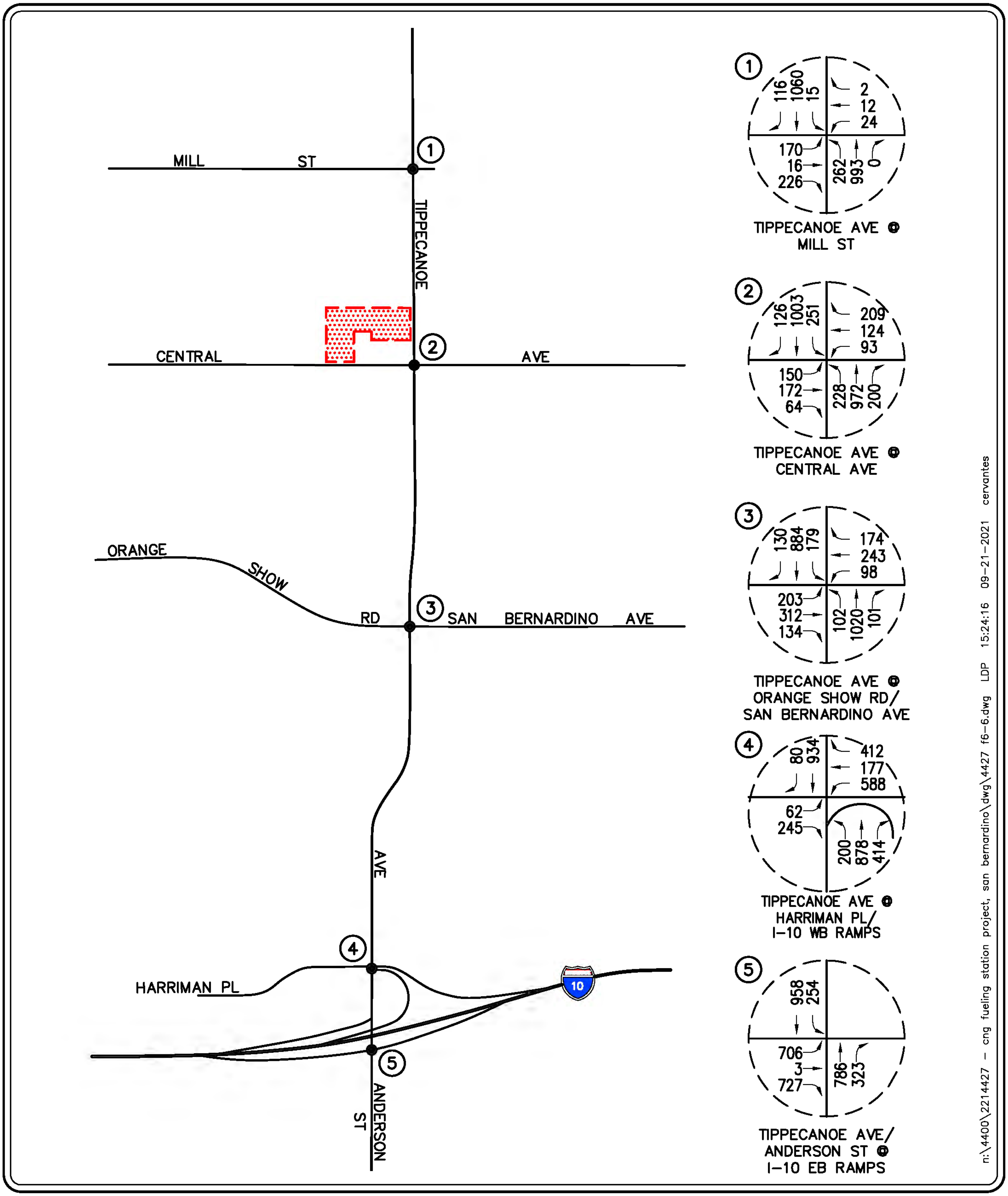
N NO SCALE

KEY
(#) = STUDY INTERSECTION
= PROJECT SITE

FIGURE 6-5

PM PEAK HOUR
CUMULATIVE PROJECTS TRAFFIC VOLUMES
CNG FUELING STATION PROJECT, SAN BERNARDINO



LINSCOTT LAW & GREENSPAN engineers

N NO SCALE

KEY

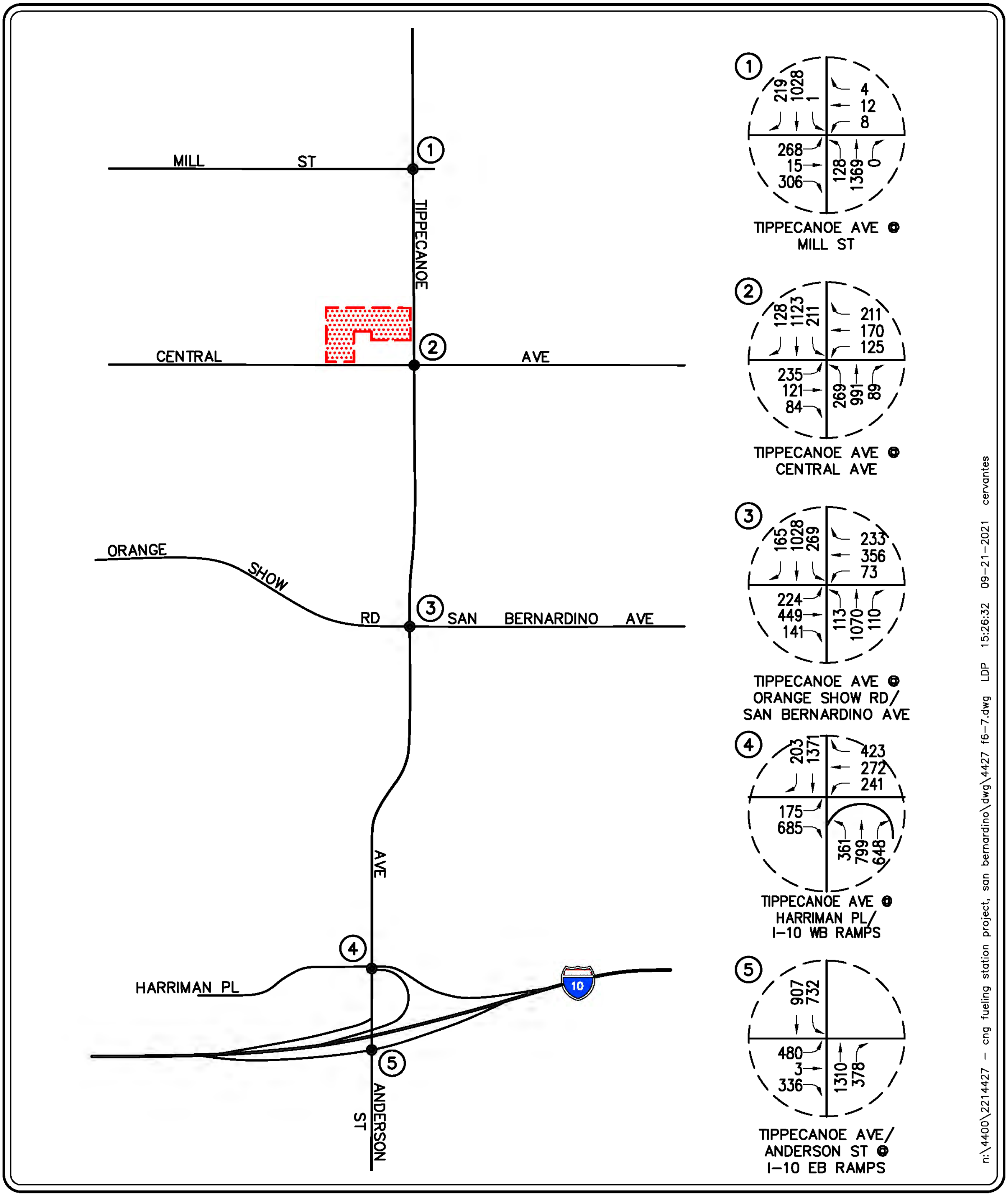
= STUDY INTERSECTION

= PROJECT SITE

FIGURE 6–6

YEAR 2023 WITHOUT PROJECT AM PEAK HOUR TRAFFIC VOLUMES

CNG FUELING STATION PROJECT, SAN BERNARDINO



LINSCOTT LAW & GREENSPAN engineers

N NO SCALE

KEY

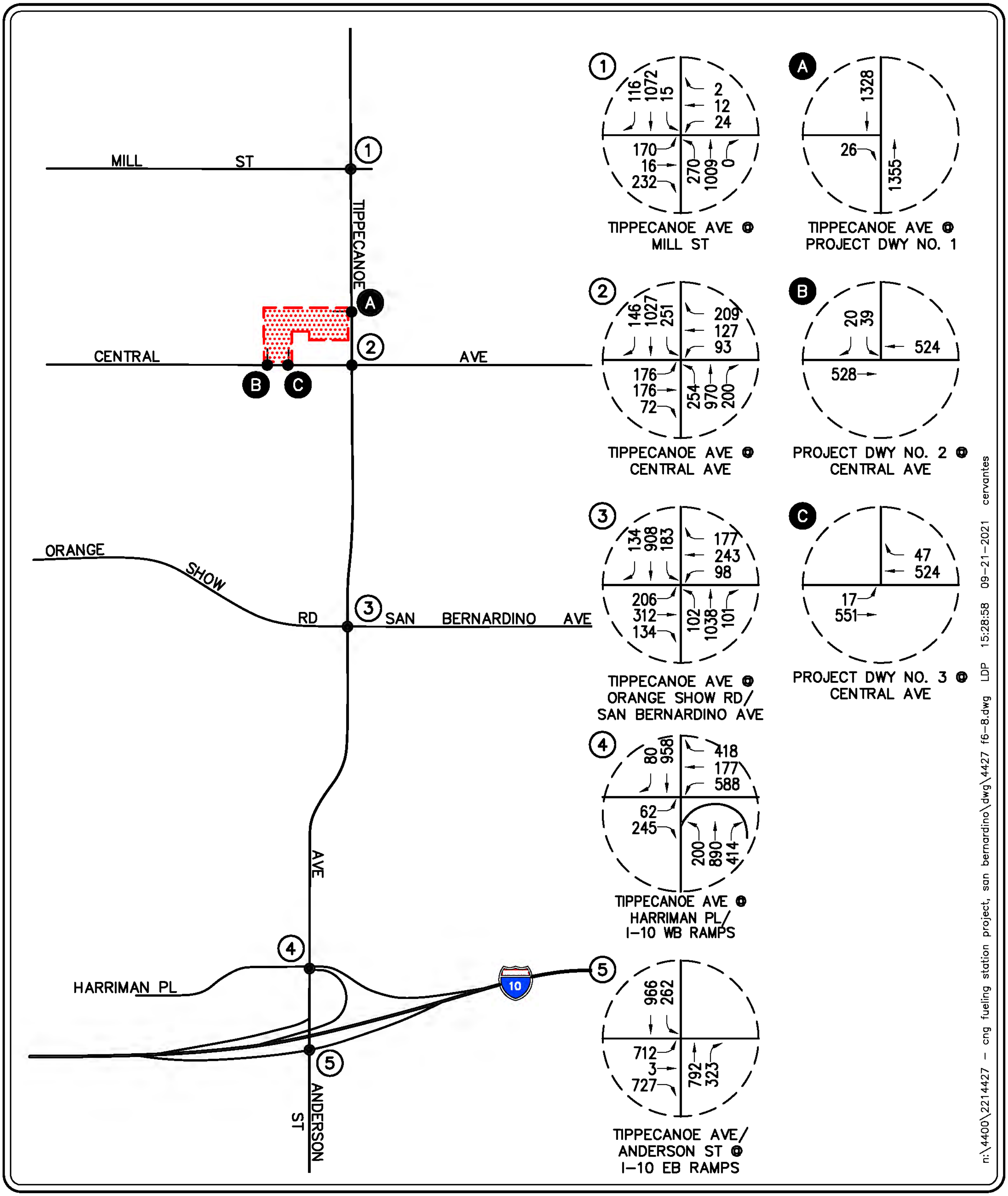
(#) = STUDY INTERSECTION

= PROJECT SITE

FIGURE 6-7

YEAR 2023 WITHOUT PROJECT PM PEAK HOUR TRAFFIC VOLUMES

CNG FUELING STATION PROJECT, SAN BERNARDINO



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N NO SCALE

KEY

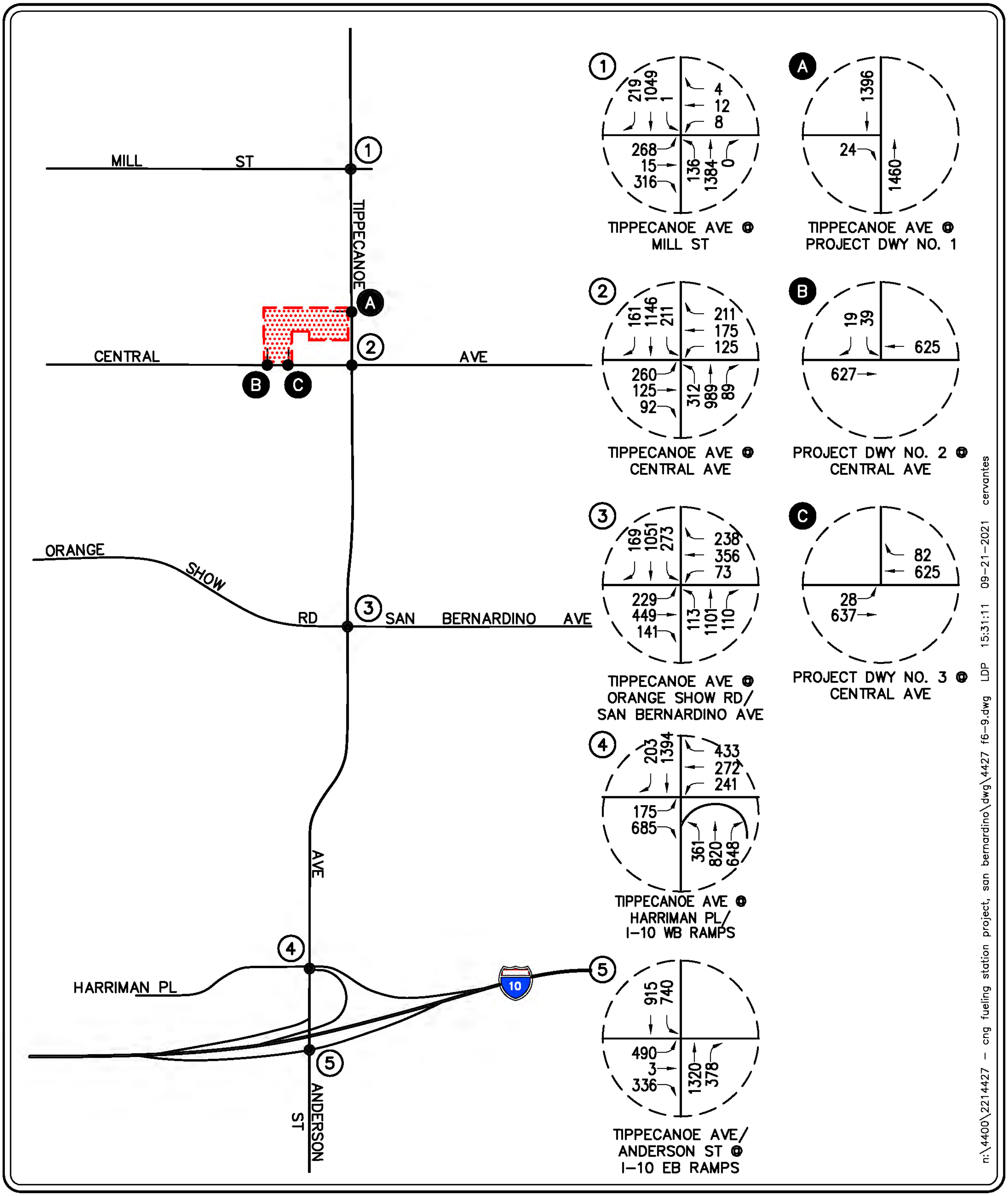
(#) = STUDY INTERSECTION

= PROJECT SITE

FIGURE 6-8

YEAR 2023 WITH PROJECT
AM PEAK HOUR TRAFFIC VOLUMES

CNG FUELING STATION PROJECT, SAN BERNARDINO



LINSCOTT LAW & GREENSPAN engineers

N NO SCALE

KEY
(#) = STUDY INTERSECTION
= PROJECT SITE

FIGURE 6-9

YEAR 2023 WITH PROJECT PM PEAK HOUR TRAFFIC VOLUMES

CNG FUELING STATION PROJECT, SAN BERNARDINO

7.0 EXISTING WITH PROJECT ANALYSIS

Table 7-1 summarizes the peak hour Level of Service results at the five (5) key study intersections for existing traffic conditions, without and with the proposed Project. The first column (1) of Delay/LOS values in *Table 7-1* presents a summary of Existing AM and PM peak hour traffic conditions. The second column (2) presents forecast Existing With Project traffic conditions. The third column (3) shows whether the traffic associated with the Project will have a significant impact based on the LOS standards and the significant impact criteria defined in this report. The fourth column (4) indicates the anticipated operating conditions with implementation of improvements recommended to mitigate Project traffic and/or achieve an acceptable Level of Service.

7.1 Existing Traffic Conditions

Review of column (1) of *Table 7-1* indicates that for Existing traffic conditions, all five (5) key study intersections currently operate at acceptable LOS C or better during the AM and PM peak hours when compared to the LOS standards defined in this report.

7.2 Existing With Project Traffic Conditions

Review of columns 2 and 3 of *Table 7-1* indicates that traffic associated with the proposed Project ***will not*** significantly impact the five (5) key study intersections when compared to the LOS standards and significant impact criteria specified in this report. The five (5) key study intersections currently operate and are forecast to continue to operate at an acceptable LOS during the AM and PM peak hours with the addition of Project generated traffic to existing traffic.

Appendix C contains the Delay/LOS calculation worksheets for Existing and Existing With Project Traffic Conditions.

TABLE 7-1
EXISTING WITH PROJECT CONDITIONS PEAK HOUR INTERSECTION CAPACITY ANALYSIS SUMMARY

Key Intersection		Jurisdiction	Minimum Acceptable LOS	Time Period	(1) Existing Traffic Conditions			(2) Existing With Project Traffic Conditions			(3) Significant Impact		(4) Existing With Project With Improvements		
					Delay	LOS	V/C	Delay	LOS	V/C	V/C or Delay Inc.	Yes/No	Delay	LOS	V/C
1.	Tippecanoe Avenue at Mill Street	San Bernardino	D	AM	19.7 s/v	B	0.518	19.9 s/v	B	0.531	0.013	No	--	--	--
				PM	17.8 s/v	B	0.489	18.1 s/v	B	0.493	0.004	No	--	--	--
2.	Tippecanoe Avenue at Central Avenue	San Bernardino	D	AM	25.2 s/v	C	0.514	26.3 s/v	C	0.517	0.003	No	--	--	--
				PM	25.5 s/v	C	0.526	27.3 s/v	C	0.546	0.020	No	--	--	--
3.	Tippecanoe Avenue at Orange Show Rd/San Bernardino Ave	San Bernardino	D	AM	27.7 s/v	C	0.653	27.7 s/v	C	0.665	0.012	No	--	--	--
				PM	29.9 s/v	C	0.750	30.2 s/v	C	0.769	0.019	No	--	--	--
4.	Tippecanoe Avenue at Harriman Place/I-10 WB Ramps	San Bernardino/ Caltrans	D	AM	28.0 s/v	C	0.535	28.0 s/v	C	0.539	0.004	No	--	--	--
				PM	34.4 s/v	C	0.839	34.4 s/v	C	0.848	0.009	No	--	--	--
5.	Tippecanoe Avenue/Anderson St at I-10 EB Ramps	Loma Linda/ Caltrans	D	AM	22.4 s/v	C	--	22.5 s/v	C	--	0.1 s/v	No	--	--	--
				PM	26.4 s/v	C	--	26.7 s/v	C	--	0.3 s/v	No	--	--	--

Notes:
- s/v = seconds per vehicle (delay)
- LOS = Level of Service
- **Bold Delay/LOS values** indicate adverse service levels based on the LOS standards as defined in this report

8.0 YEAR 2023 WITH PROJECT ANALYSIS

Table 8-1 summarizes the AM and PM peak hour Level of Service results at the five (5) key study intersections for Year 2023 traffic conditions. The first column (1) of Delay/LOS values in *Table 8-1* presents a summary of existing AM and PM peak hour traffic conditions (which were also presented in *Table 7-1*). The second column (2) presents forecast Year 2023 Without Project traffic conditions and the third column (3) identifies forecast Year 2023 With Project traffic conditions. The fourth column (4) indicates whether the traffic associated with the Project will have a significant impact based on the LOS standards and the significant impact criteria defined in this report. The fifth column (5) indicates the anticipated operating conditions with implementation of improvements recommended to mitigate Project traffic and/or achieve an acceptable Level of Service.

8.1 Year 2023 Without Project Traffic Conditions

An analysis of future (Year 2023) cumulative traffic conditions indicates that the addition of ambient traffic growth and cumulative projects traffic *will not* adversely impact the five (5) key study intersections. The five (5) key study intersections are forecast to continue to operate at acceptable levels of service during the AM and PM peak hours with the addition of ambient traffic growth and cumulative projects traffic.

8.2 Year 2023 With Project Traffic Conditions

Review of columns 3 and 4 of *Table 8-1* indicates that traffic associated with the proposed Project ***will not*** significantly impact the five (5) key study intersections when compared to the LOS standards and significant impact criteria specified in this report. The five (5) key study intersections are forecast to continue to operate at an acceptable LOS D or better during the AM and PM peak hours with the addition of Project generated traffic in the horizon Year 2023.

Appendix D contains the Delay/LOS calculation worksheets for Year 2023 Traffic Conditions and Year 2023 With Project Traffic Conditions.

TABLE 8-1

YEAR 2023 WITH PROJECT CONDITIONS PEAK HOUR INTERSECTION CAPACITY ANALYSIS SUMMARY

Key Intersection	Jurisdiction	Min. Acc. LOS	Time Period	(1) Existing Traffic Conditions			(2) Year 2023 Without Project Traffic Conditions			(3) Year 2023 With Project Traffic Conditions			(4) Significant Impact		(5) Year 2023 With Project With Improvements		
				Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	V/C or Delay Inc.	Yes/ No	Delay	LOS	V/C
1. Tippecanoe Avenue at Mill Street	San Bernardino	D	AM	19.7 s/v	B	0.518	25.6 s/v	C	0.678	26.9 s/v	C	0.689	0.011	No	--	--	--
			PM	17.8 s/v	B	0.489	20.0 s/v	B	0.580	20.3 s/v	C	0.593	0.013	No	--	--	--
2. Tippecanoe Avenue at Central Avenue	San Bernardino	D	AM	25.2 s/v	C	0.514	28.6 s/v	C	0.603	29.7 s/v	C	0.640	0.037	No	--	--	--
			PM	25.5 s/v	C	0.526	31.6 s/v	C	0.658	37.4 s/v	D	0.695	0.037	No	--	--	--
3. Tippecanoe Avenue at Orange Show Rd/San Bernardino Ave	San Bernardino	D	AM	27.7 s/v	C	0.653	33.2 s/v	C	0.825	34.2 s/v	C	0.837	0.012	No	--	--	--
			PM	29.9 s/v	C	0.750	44.7 s/v	D	0.889	46.3 s/v	D	0.906	0.017	No	--	--	--
4. Tippecanoe Avenue at Harriman Place/I-10 WB Ramps	San Bernardino / Caltrans	D	AM	28.0 s/v	C	0.535	29.2 s/v	C	0.606	29.2 s/v	C	0.610	0.004	No	--	--	--
			PM	34.4 s/v	C	0.839	40.2 s/v	D	0.963	40.4 s/v	D	0.970	0.007	No	--	--	--
5. Tippecanoe Avenue/Anderson St at I-10 EB Ramps	Loma Linda / Caltrans	D	AM	22.4 s/v	C	--	24.0 s/v	C	--	24.2 s/v	C	--	0.2 s/v	No	--	--	--
			PM	26.4 s/v	C	--	35.8 s/v	D	--	36.7 s/v	D	--	0.9 s/v	No	--	--	--

Notes:
- s/v = seconds per vehicle (delay)
- LOS = Level of Service
- **Bold Delay/LOS values** indicate adverse service levels based on the LOS standards as defined in this report

9.0 SITE ACCESS AND INTERNAL CIRCULATION EVALUATION

9.1 Site Access

As shown on *Figure 2-2,* vehicular access to the Project will be provided via one (1) right-turn out only unsignalized driveway located along Tippecanoe Avenue (i.e. Project Driveway No. 1), one (1) full-egress only unsignalized driveway located along Central Avenue (i.e. Project Driveway No. 2), and one (1) full-ingress only unsignalized driveway located along Central Avenue (i.e. Project Driveway No. 3).

Table 9-1 summarizes the intersection operations at the proposed Project driveways for near-term (Year 2023) traffic conditions at completion and full occupancy of the proposed Project. The operations analysis for the Project driveways is based on the *Highway Capacity Manual 6th Edition* (HCM 6) unsignalized methodology. Review of *Table 9-1* shows that the three (3) Project driveways are forecast to operate at acceptable LOS C or better during the AM and PM peak hours for Year 2023 With Project traffic conditions. As such, project access will be adequate. Motorists entering and exiting the Project site will be able to do so comfortably, safely, and without undue congestion.

Appendix E contains the Delay/LOS calculation worksheets for the project driveways for Year 2023 With Project Traffic Conditions.

9.2 Internal Circulation Evaluation

The on-site circulation layout of the proposed Project as illustrated in *Figure 2-2* on an overall basis is adequate. Curb return radii have been confirmed and are generally adequate for small service/delivery (FedEx, UPS) trucks and large trucks (tractors).

TABLE 9-1
PROJECT DRIVEWAY PEAK HOUR LEVELS OF SERVICE SUMMARY

Key Intersection		Time Period	Intersection Control	Year 2023 With Project Traffic Conditions	
				HCM	LOS
A.	Tippecanoe Avenue at	AM	One–Way Stop	17.0 s/v	C
	Project Driveway No. 1	PM	(Outbound Only)	17.6 s/v	C
B.	Project Driveway No. 2 at	AM	One–Way Stop	12.5 s/v	B
	Central Avenue	PM	(Outbound Only)	13.6 s/v	B
C.	Project Driveway No. 3 at	AM	Inbound Only	8.8 s/v	A
	Central Avenue	PM		9.3 s/v	A

Notes:
s/v = seconds per vehicle

10.0 CALTRANS FACILITIES ANALYSIS

Caltrans requires the use of analysis methods provided in the Highway Capacity Manual 6 (*HCM 6)* for the analysis of ramp intersections. Caltrans "endeavors to maintain a target LOS at the transition between LOS "C" and LOS "D" on State highway facilities"; it does not require that LOS "D" (shall) be maintained. However, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS. For this analysis, LOS D is the target level of service standard and will be utilized to assess the Project impacts at the state-controlled study intersections.

Ramp Intersection Capacity Analyses were conducted for the following two (2) state-controlled key study intersections:

4. Tippecanoe Avenue at Harriman Place/I-10 Westbound Ramps
5. Tippecanoe Avenue/Anderson Street at I-10 Eastbound Ramps

10.1 Ramp Intersection Capacity Analysis

As shown in ***Tables 7-1*** and ***8-1***, presented previously in Sections 7.0 and 8.0, the two (2) state-controlled study intersections are forecast to operate at an acceptable LOS D or better during the AM peak hour and PM peak hour without and with the proposed Project for all analyzed traffic conditions.

11.0 RECOMMENDED IMPROVEMENTS

For those intersections where projected traffic volumes are expected to result in significant impacts, this report recommends traffic improvements that change the intersection geometry to increase capacity. These capacity improvements involve roadway widening and/or re-striping to reconfigure (add lanes) roadways to specific approaches of a key intersection. The identified improvements are expected to:

- Address the impact of existing traffic, Project traffic and future non-project (ambient traffic growth and cumulative) traffic, and
- Improve Levels of Service to an acceptable range and/or to pre-project conditions.

11.1 Existing With Project Traffic Conditions

The results of the Existing With Project traffic conditions level of service analyses indicate that the proposed Project ***will not*** significantly impact any of the five (5) key study intersections. All five (5) key study intersections are forecast to operate at acceptable service levels under Existing With Project traffic conditions. As such, no improvement measures have been recommended.

11.2 Year 2023 With Project Traffic Conditions

The results of the Year 2023 With Project traffic conditions level of service analyses indicate that the proposed Project ***will not*** significantly impact any of the five (5) key study intersections. All five (5) key study intersections are forecast to operate at acceptable service levels under Year 2023 With Project traffic conditions. As such, no improvement measures have been recommended.

12.0 VEHICLE MILES TRAVELED (VMT) ANALYSIS

On December 28, 2018, the California Natural Resources Agency adopted revised CEQA Guidelines. Among the changes to the guidelines was the removal of vehicle delay and LOS from consideration for transportation impacts under CEQA. With the adopted guidelines, transportation impacts are to be evaluated based on a project's effect on vehicle miles traveled. Lead agencies are allowed to continue using their current impact criteria, or to opt into the revised transportation guidelines. However, the new guidelines must be used starting July 1, 2020, as required in CEQA section 15064.3. The City of San Bernardino recently adopted new traffic impact criteria in August 2020 to be consistent with the CEQA revisions. These new guidelines are contained within the *City of San Bernardino Traffic Impact Analysis Guidelines,* dated August 2020 and provide screening criteria and methodology for VMT analysis.

For the VMT screening analysis, *Project Screening – Step 3: Project Type Screening* was applied to the proposed Project. *Project Screening – Step 3: Project Type Screening* states that for local serving retail uses (including gas stations) less than 50,000 square feet (SF), a less than significant determination can be presumed. Local serving retail (including gas stations) generally improves the convenience of shopping close to home and has the effect of reducing vehicular travel.

As stated in *Section 2.0*, the proposed Project will consist of CNG time fill posts for 215 trucks and parking for 215 passenger vehicles, as well as four (4) fast fill CNG dispenser fueling positions. Therefore, based on the aforementioned criteria, this project could be screened from a VMT analysis, and could be presumed to have a less than significant impact on VMT per the City's guidelines.

APPENDIX A

TRAFFIC STUDY SCOPE OF WORK

City of San Bernardino Public Works / Traffic Engineering Department
Traffic Scope Approval Form

To be completed by applicant consultant and approved by Public Works prior to start of study

Project Name: CNG Fueling Station Project
Project Address: Mr. Matt Loser (Clean Energy Fuels)
Project Description: Northwest corner of Tippecanoe Ave and Central Ave in the City of San Bernardino, CA - See ***Figure 1-1 (Vicinity Map)***
4 CNG Dispensers (4 VFP's), 2 Hydrogen Dispensers (2 VFP's), and 186 Time Fill Posts
Developer's Name: Clean Energy Fuels — See ***Figure 2-1 (Existing Site Aerial)*** and ***Figure 2-2 (Proposed Site Plan)***
Address:
Telephone No. (949) 437-1429 Email address: matt.loser@cleanenergyfuels.com

Trip Generation Rates from ITE Latest Edition
(ITE 10th Edition; See ***Tables 5-1 & 5-2)***

	Land Use (1)	Land Use (2)
Land Use	Renewable Natural Gas (RNG) Fuel Station	Time Fill Posts
Development Sq Ft	6 VFP	186 Spaces
ITE Land Use Code	944 and proposed operations	N/A, based on proposed operations - see Table 5-1
Daily Trips	708	933
AM Peak Hour Trips		
Inbound	22	38
Outbound	21	57
Total	43	95
PM Peak Hour Trips		
Inbound	29	71
Outbound	29	47
Total	58	118

(Use Additional Sheet(s), if necessary)

Pass-by Trips (%), if applicable: Daily: 25%, AM: 25%, PM:25%

	Land Use (1)	Land Use (2)
Land Use	Renewable Natural Gas (RNG) Fuel Station	--
ITE Land Use Code	944	--
Daily Trips	-172	--
AM Peak Hour Trips		
Inbound	-5	--
Outbound	-5	--
Total	-10	--
PM Peak Hour Trips:		
Inbound	-7	--
Outbound	-7	--
Total	-14	--

Net Project Trips: Daily = 1,469; AM = 128 (55 Inbound, 73 Outbound); PM = 162 (93 Inbound, 69 Outbound)

Project Opening Year: 2023 **Build-out Year:** N/A

Study Intersections:
1. ~~Tippecanoe Avenue at Mill Street~~
2. ~~Tippecanoe Avenue at Central Avenue~~
3. ~~Tippecanoe Ave at Orange Show Rd/San Bernardino Ave~~
4. ~~Tippecanoe Ave at Harriman Pl/I-10 WB Ramps~~
5. ~~Tippecanoe Ave/Anderson St at I-10 EB Ramps~~
6.
7.
8.
9.
10.

(Use Additional Sheet(s) and Maps to show project Boundaries & Attach memo for project Description)

City of San Bernardino Public Works / Traffic Engineering Department
Traffic Scope Approval Form
To be completed by applicant consultant and approved by Public Works prior to start of study

Study Roadway Segments: 1 N/A 2 ______
3 ______ 4 ______
5 ______ 6 ______

Proposed Development Use: ☐ Residential ☒ Commercial ☐ Mixed Use ☐ Other

Software Methodology: ☐ Synchro ☒ HCS (Vistro software to be used based on the HCM methodology)

Additional issues to be considered:
- ☐ Traffic calming measures
- ☐ Queuing Analysis
- ☐ Bike/Ped Accommodations
- ☐ Merge Analysis
- ☐ Gap Analysis
- ☐ Actuation/Coordination
- ☐ Safety Analysis
- ☐ Sight Distance Analysis

Is the project screened from VMT assessment? ☒ Yes ☐ No

VMT Screening Justification: Step 3: Project Type Screening - Local Serving Retail Uses Less than 50,000 SF (Gas Stations)

Ambient Growth Rate: 3.0 %

Trip Distribution: East 5 % West 25 % North 30 % South 40 % See *Figure 5-1*

Consultant Preparer's Name: Linscott, Law & Greenspan Engineers

Address: 2 Executive Circle, Suite 250

Telephone No. (949) 625-8175 PE / TE License #: TE No. 2200

Email Address: kloos@llgengineers.com

Signature Daniel A. Kloos Date: 06-24-2021

Approved By (Public Works Department):

Signature: Azzam Jabsheh Date: 7/21/2021

Name: Azzam Jabsheh Title: Traffic Engineer

submit w/ TIA

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LINSCOTT LAW & GREENSPAN engineers

NO SCALE

SOURCE: GOOGLE

KEY

(#) = STUDY INTERSECTION

= PROJECT SITE

FIGURE 1-1

VICINITY MAP

CNG FUELING STATION PROJECT, SAN BERNARDINO

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LINSCOTT LAW & GREENSPAN engineers

N NO SCALE

SOURCE: GOOGLE

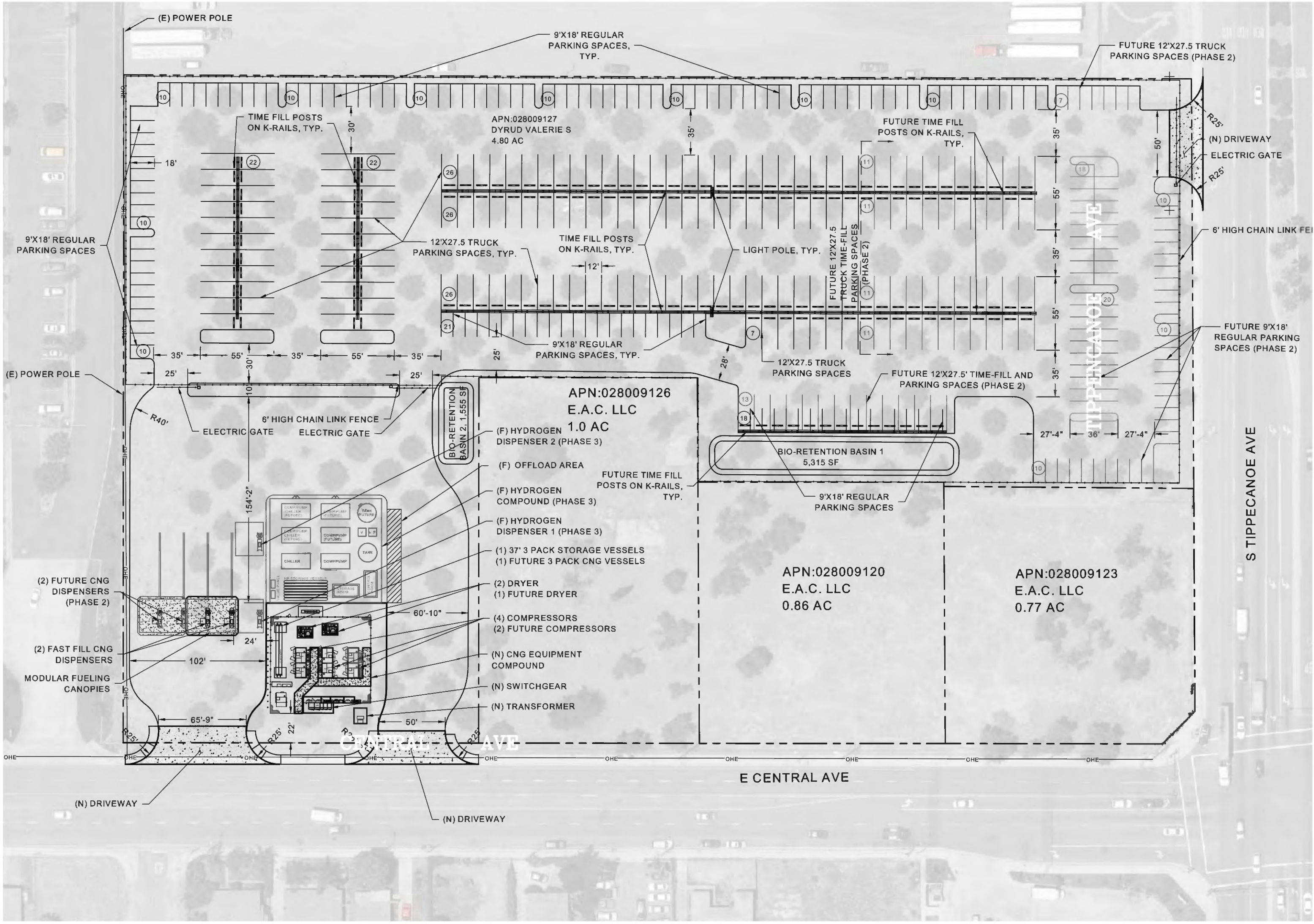
KEY

= PROJECT SITE

FIGURE 2-1

EXISTING SITE AERIAL

CNG FUELING STATION PROJECT, SAN BERNARDINO



n:\4400\2214427 – cng fueling station project, san bernardino\dwg\4427 f2-2.dwg LDP 09:38:12 06-17-2021 aguilar

SOURCE: CLEAN ENERGY

LINSCOTT LAW & GREENSPAN engineers

N NO SCALE

FIGURE 2-2

PROPOSED SITE PLAN

CNG FUELING STATION PROJECT, SAN BERNARDINO

Linscott Law & Greenspan engineers

Table 5-1
Project Traffic Generation Forecast – Proposed Operations for Time Fill Posts[1]
CNG Fueling Station Project, San Bernardino

Time of Day	(1) Passenger Vehicles Associated with Trucks		(2) Trucks		(3) Trucks (PCE = 1.5)		(4) Total Vehicle Trips (1) + (3)		
	In	Out	In	Out	In	Out	In	Out	Total
5:00 AM	37	0	0	0	0	0	37	0	37
5:30 AM	0	0	0	37	0	56	0	56	56
6:00 AM	37	0	0	0	0	0	37	0	37
6:30 AM	0	0	0	37	0	56	0	56	56
7:00 AM	37	0	0	0	0	0	37	0	37
7:30 AM	0	0	0	37	0	56	0	56	56
8:00 AM	**38**	**0**	**0**	**0**	**0**	**0**	**38**	**0**	**38**
8:30 AM	**0**	**0**	**0**	**38**	**0**	**57**	**0**	**57**	**57**
9:00 AM	37	0	0	0	0	0	37	0	37
9:30 AM	0	0	0	37	0	56	0	56	56
10:00 AM	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0
1:00 PM	0	0	0	0	0	0	0	0	0
1:30 PM	0	0	0	0	0	0	0	0	0
2:00 PM	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0
5:00 PM	**0**	**0**	**47**	**0**	**71**	**0**	**71**	**0**	**71**
5:30 PM	**0**	**47**	**0**	**0**	**0**	**0**	**0**	**47**	**47**
6:00 PM	0	0	47	0	71	0	71	0	71
6:30 PM	0	47	0	0	0	0	0	47	47
7:00 PM	0	0	46	0	69	0	69	0	69
7:30 PM	0	46	0	0	0	0	0	46	46
8:00 PM	0	0	46	0	69	0	69	0	69
8:30 PM	0	46	0	0	0	0	0	46	46
9:00 PM	0	0	0	0	0	0	0	0	0
CNG Fueling Station Project (Time Fill Posts) Trip Generation Forecast					**Daily (PCE)**		933[2]		
					AM Peak Hour (PCE)		**38**	**57**	**95**
					PM Peak Hour (PCE)		**71**	**47**	**118**

1 Source: based on the proposed operations for the 186 time fill posts provided by the project applicant, which consists of the following.

- 186 trucks will enter the site between 5:00 PM – 9:00 PM. This results in an average of 47 trucks per hour entering the site over the 4-hour period. After the truck is parked in the time fill post parking space, the truck driver will leave the site in a passenger vehicle. This results in an average of 47 passenger vehicles per hour leaving the site over the 4-hour period. During the truck rollout in the morning (i.e. between 5:00 AM – 10:00 AM), on average, 37 passenger vehicles will enter the site and 37 trucks will exit the site over the 5-hour period.

2 It should be noted that the vehicle trips (Non PCE) are 744 daily, 76 AM peak hour and 94 PM peak hour.

TABLE 5-2
PROJECT TRAFFIC GENERATION FORECAST
CNG FUELING STATION PROJECT, SAN BERNARDINO

ITE Land Use Code / Project Description	Daily	AM Peak Hour Enter	AM Peak Hour Exit	AM Peak Hour Total	PM Peak Hour Enter	PM Peak Hour Exit	PM Peak Hour Total
Generation Rates:							
▪ 944: Gasoline Service Station (TE/VFP)[3]	172.01	50%	50%	10.28	50%	50%	14.03
▪ Hydrogen Dispensers[4]	--	--	--	--	--	--	--
▪ Time Fill Posts[5]	--	--	--	--	--	--	--
CNG Fueling Station Project Generation Forecasts:							
▪ Fast Fill CNG Dispensers (4 VFP)	688	21	20	41	28	28	56
Pass-By (Daily: 25%, AM: 25%, PM: 25%)[6]	-172	-5	-5	-10	-7	-7	-14
[A] Subtotal	***516***	***16***	***15***	***31***	***21***	***21***	***42***
▪ ***[B] Hydrogen Dispensers (2 VFP)***	***20***	***1***	***1***	***2***	***1***	***1***	***2***
▪ ***[C] Time Fill Posts (186 Spaces)***	***933***	***38***	***57***	***95***	***71***	***47***	***118***
Total Net Proposed Project Trip Generation [A] + [B] + [C]	**1,469**	**55**	**73**	**128**	**93**	**69**	**162**

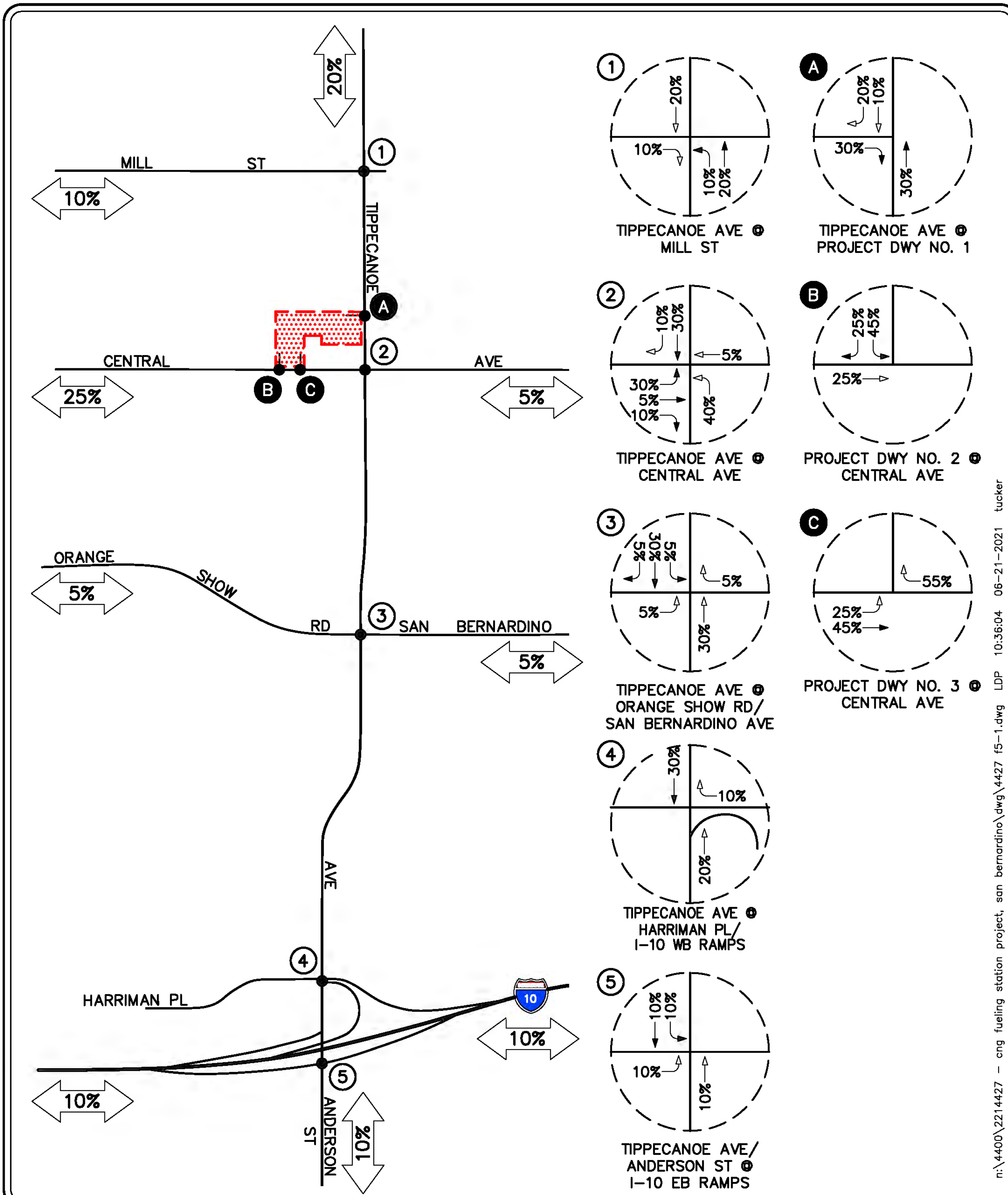
Notes:
- TE/VFP = Trip end per vehicle fueling position

3 Source: *Trip Generation, 10th Edition*, Institute of Transportation Engineers, (ITE) [Washington, D.C. (2017)].

4 The trip generation for the hydrogen dispensers is based on the proposed operations provided by the project applicant. A maximum of 10 vehicles per day will utilize the hydrogen dispensers resulting in 20 daily trips. To provide a conservative analysis it was assumed that 1 vehicle trip will occur during the AM peak hour and 1 vehicle trip will occur during the PM peak hour.

5 Source: based on the proposed operations provided by the project applicant (see *Table 5-1*).

6 A pass-by reduction of 25% was assumed for daily traffic, AM peak hour traffic and PM peak hour traffic for the fast fill CNG dispensers.



LINSCOTT LAW & GREENSPAN engineers

N NO SCALE

KEY

(#) = STUDY INTERSECTION

= INBOUND PERCENTAGE

= OUTBOUND PERCENTAGE

= PROJECT SITE

FIGURE 5-1

PROJECT TRAFFIC DISTRIBUTION PATTERN

CNG FUELING STATION PROJECT, SAN BERNARDINO

APPENDIX B

EXISTING TRAFFIC COUNT DATA

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951)268-6268

City of San Bernardino
N/S: Tippecanoe Avenue
E/W: Mill Street
Weather: Clear

File Name : 01_SBC_Tippecanoe_Mill AM
Site Code : 05721367
Start Date : 7/29/2021
Page No : 1

Groups Printed- Total Volume

	Tippecanoe Avenue Southbound				State Bros. Receiving Driveway Westbound				Tippecanoe Avenue Northbound				Mill Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	1	138	17	156	7	2	0	9	28	118	0	146	16	2	23	41	352
07:15 AM	4	140	13	157	4	0	0	4	14	126	0	140	21	4	29	54	355
07:30 AM	1	154	17	172	4	3	0	7	32	156	0	188	30	3	22	55	422
07:45 AM	3	158	21	182	0	2	1	3	41	169	0	210	37	1	23	61	456
Total	9	590	68	667	15	7	1	23	115	569	0	684	104	10	97	211	1585
08:00 AM	0	123	19	142	2	8	1	11	16	102	0	118	21	4	33	58	329
08:15 AM	3	127	23	153	1	1	2	4	29	131	0	160	23	4	17	44	361
08:30 AM	2	119	21	142	2	1	0	3	19	130	0	149	15	1	12	28	322
08:45 AM	0	128	18	146	2	6	1	9	24	105	1	130	19	6	24	49	334
Total	5	497	81	583	7	16	4	27	88	468	1	557	78	15	86	179	1346
Grand Total	14	1087	149	1250	22	23	5	50	203	1037	1	1241	182	25	183	390	2931
Apprch %	1.1	87	11.9		44	46	10		16.4	83.6	0.1		46.7	6.4	46.9		
Total %	0.5	37.1	5.1	42.6	0.8	0.8	0.2	1.7	6.9	35.4	0	42.3	6.2	0.9	6.2	13.3	

	Tippecanoe Avenue Southbound				State Bros. Receiving Driveway Westbound				Tippecanoe Avenue Northbound				Mill Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	1	138	17	156	**7**	2	0	**9**	28	118	0	146	16	2	23	41	352
07:15 AM	**4**	140	13	157	4	0	0	4	14	126	0	140	21	**4**	**29**	54	355
07:30 AM	1	154	17	172	4	**3**	0	7	32	156	0	188	30	3	22	55	422
07:45 AM	3	**158**	**21**	**182**	0	2	**1**	3	**41**	**169**	0	**210**	**37**	1	23	**61**	**456**
Total Volume	9	590	68	667	15	7	1	23	115	569	0	684	104	10	97	211	1585
% App. Total	1.3	88.5	10.2		65.2	30.4	4.3		16.8	83.2	0		49.3	4.7	46		
PHF	.563	.934	.810	.916	.536	.583	.250	.639	.701	.842	.000	.814	.703	.625	.836	.865	.869

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City of San Bernardino
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E/W: Mill Street
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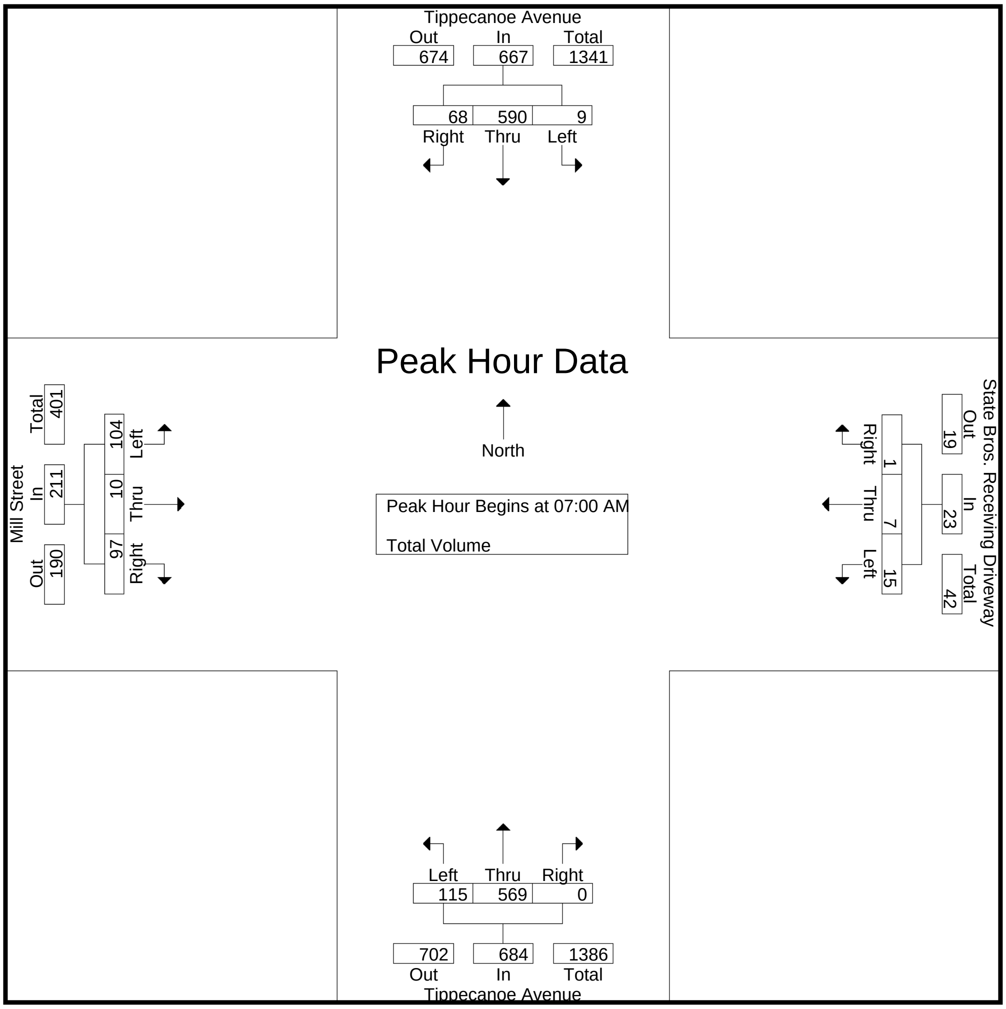
File Name : 01_SBC_Tippecanoe_Mill AM
Site Code : 05721367
Start Date : 7/29/2021
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:00 AM				08:00 AM				07:00 AM				07:15 AM			
+0 mins.	1	138	17	156	**2**	**8**	1	**11**	28	118	0	146	21	**4**	29	54
+15 mins.	**4**	140	13	157	1	1	**2**	4	14	126	0	140	30	3	22	55
+30 mins.	1	154	17	172	2	1	0	3	32	156	0	188	**37**	1	23	**61**
+45 mins.	3	**158**	**21**	**182**	2	6	1	9	**41**	**169**	0	**210**	21	4	**33**	58
Total Volume	9	590	68	667	7	16	4	27	115	569	0	684	109	12	107	228
% App. Total	1.3	88.5	10.2		25.9	59.3	14.8		16.8	83.2	0		47.8	5.3	46.9	
PHF	.563	.934	.810	.916	.875	.500	.500	.614	.701	.842	.000	.814	.736	.750	.811	.934

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File Name : 01_SBC_Tippecanoe_Mill PM
Site Code : 05721367
Start Date : 7/29/2021
Page No : 1

Groups Printed- Total Volume

	Tippecanoe Avenue Southbound				State Bros. Receiving Driveway Westbound				Tippecanoe Avenue Northbound				Mill Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	1	185	20	206	4	4	3	11	21	233	1	255	41	1	42	84	556
04:15 PM	2	151	11	164	9	1	4	14	23	212	0	235	37	1	31	69	482
04:30 PM	1	176	27	204	1	1	1	3	14	225	0	239	52	4	60	116	562
04:45 PM	0	146	51	197	3	6	1	10	14	246	0	260	48	3	34	85	552
Total	4	658	109	771	17	12	9	38	72	916	1	989	178	9	167	354	2152
05:00 PM	0	203	56	259	0	1	1	2	16	259	0	275	51	1	49	101	637
05:15 PM	0	153	26	179	2	1	0	3	15	222	0	237	45	3	48	96	515
05:30 PM	1	169	31	201	5	4	1	10	15	218	0	233	45	7	41	93	537
05:45 PM	0	156	24	180	2	1	3	6	30	197	0	227	39	2	32	73	486
Total	1	681	137	819	9	7	5	21	76	896	0	972	180	13	170	363	2175
Grand Total	5	1339	246	1590	26	19	14	59	148	1812	1	1961	358	22	337	717	4327
Apprch %	0.3	84.2	15.5		44.1	32.2	23.7		7.5	92.4	0.1		49.9	3.1	47		
Total %	0.1	30.9	5.7	36.7	0.6	0.4	0.3	1.4	3.4	41.9	0	45.3	8.3	0.5	7.8	16.6	

	Tippecanoe Avenue Southbound				State Bros. Receiving Driveway Westbound				Tippecanoe Avenue Northbound				Mill Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	**1**	176	27	204	1	1	**1**	3	14	225	0	239	**52**	**4**	**60**	**116**	562
04:45 PM	0	146	51	197	**3**	**6**	1	**10**	14	246	0	260	48	3	34	85	552
05:00 PM	0	**203**	**56**	**259**	0	1	1	2	**16**	**259**	0	**275**	51	1	49	101	**637**
05:15 PM	0	153	26	179	2	1	0	3	15	222	0	237	45	3	48	96	515
Total Volume	1	678	160	839	6	9	3	18	59	952	0	1011	196	11	191	398	2266
% App. Total	0.1	80.8	19.1		33.3	50	16.7		5.8	94.2	0		49.2	2.8	48		
PHF	.250	.835	.714	.810	.500	.375	.750	.450	.922	.919	.000	.919	.942	.688	.796	.858	.889

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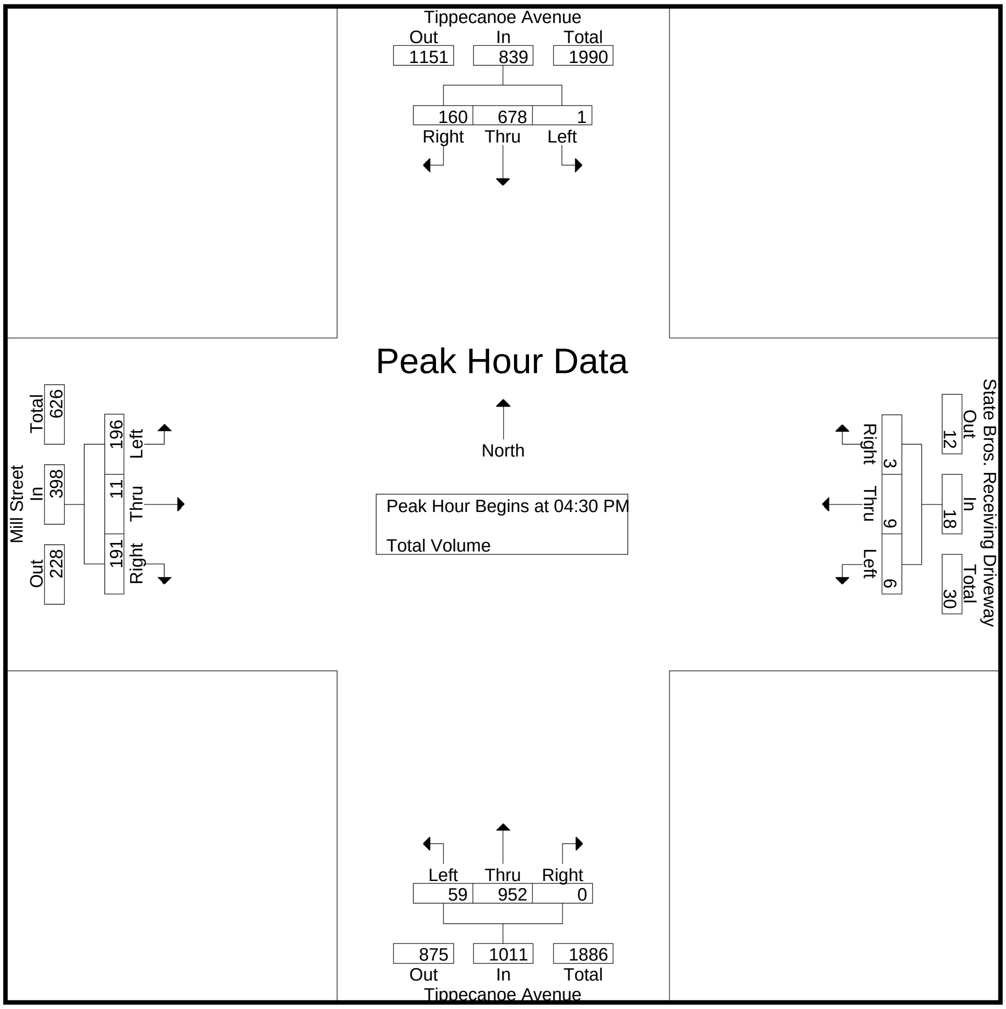

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:30 PM				04:00 PM				04:30 PM				04:30 PM			
+0 mins.	**1**	176	27	204	4	4	3	11	14	225	0	239	**52**	**4**	**60**	**116**
+15 mins.	0	146	51	197	**9**	1	**4**	**14**	14	246	0	260	48	3	34	85
+30 mins.	0	**203**	**56**	**259**	1	1	1	3	**16**	**259**	0	**275**	51	1	49	101
+45 mins.	0	153	26	179	3	**6**	1	10	15	222	0	237	45	3	48	96
Total Volume	1	678	160	839	17	12	9	38	59	952	0	1011	196	11	191	398
% App. Total	0.1	80.8	19.1		44.7	31.6	23.7		5.8	94.2	0		49.2	2.8	48	
PHF	.250	.835	.714	.810	.472	.500	.563	.679	.922	.919	.000	.919	.942	.688	.796	.858

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City of San Bernardino
N/S: Tippecanoe Avenue
E/W: Central Avenue
Weather: Clear

File Name : 02_SBC_Tippecanoe_Central AM
Site Code : 05721367
Start Date : 7/29/2021
Page No : 1

Groups Printed- Total Volume

	Tippecanoe Avenue Southbound				Central Avenue Westbound				Tippecanoe Avenue Northbound				Central Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	34	106	16	156	5	16	21	42	8	92	31	131	8	34	4	46	375
07:15 AM	36	113	11	160	7	10	25	42	13	132	38	183	10	44	4	58	443
07:30 AM	50	109	23	182	26	38	54	118	15	119	34	168	14	21	9	44	512
07:45 AM	34	130	15	179	9	12	27	48	14	177	21	212	10	19	5	34	473
Total	154	458	65	677	47	76	127	250	50	520	124	694	42	118	22	182	1803
08:00 AM	37	121	23	181	16	15	24	55	10	125	32	167	15	21	13	49	452
08:15 AM	33	76	8	117	14	9	21	44	6	101	40	147	14	21	7	42	350
08:30 AM	14	112	6	132	15	10	14	39	5	124	16	145	5	10	14	29	345
08:45 AM	17	129	13	159	12	2	15	29	13	118	16	147	10	9	9	28	363
Total	101	438	50	589	57	36	74	167	34	468	104	606	44	61	43	148	1510
Grand Total	255	896	115	1266	104	112	201	417	84	988	228	1300	86	179	65	330	3313
Apprch %	20.1	70.8	9.1		24.9	26.9	48.2		6.5	76	17.5		26.1	54.2	19.7		
Total %	7.7	27	3.5	38.2	3.1	3.4	6.1	12.6	2.5	29.8	6.9	39.2	2.6	5.4	2	10	

	Tippecanoe Avenue Southbound				Central Avenue Westbound				Tippecanoe Avenue Northbound				Central Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	36	113	11	160	7	10	25	42	13	132	**38**	183	10	**44**	4	**58**	443
07:30 AM	**50**	109	**23**	**182**	**26**	**38**	**54**	**118**	**15**	119	34	168	14	21	9	44	**512**
07:45 AM	34	**130**	15	179	9	12	27	48	14	**177**	21	**212**	10	19	5	34	473
08:00 AM	37	121	23	181	16	15	24	55	10	125	32	167	**15**	21	**13**	49	452
Total Volume	157	473	72	702	58	75	130	263	52	553	125	730	49	105	31	185	1880
% App. Total	22.4	67.4	10.3		22.1	28.5	49.4		7.1	75.8	17.1		26.5	56.8	16.8		
PHF	.785	.910	.783	.964	.558	.493	.602	.557	.867	.781	.822	.861	.817	.597	.596	.797	.918

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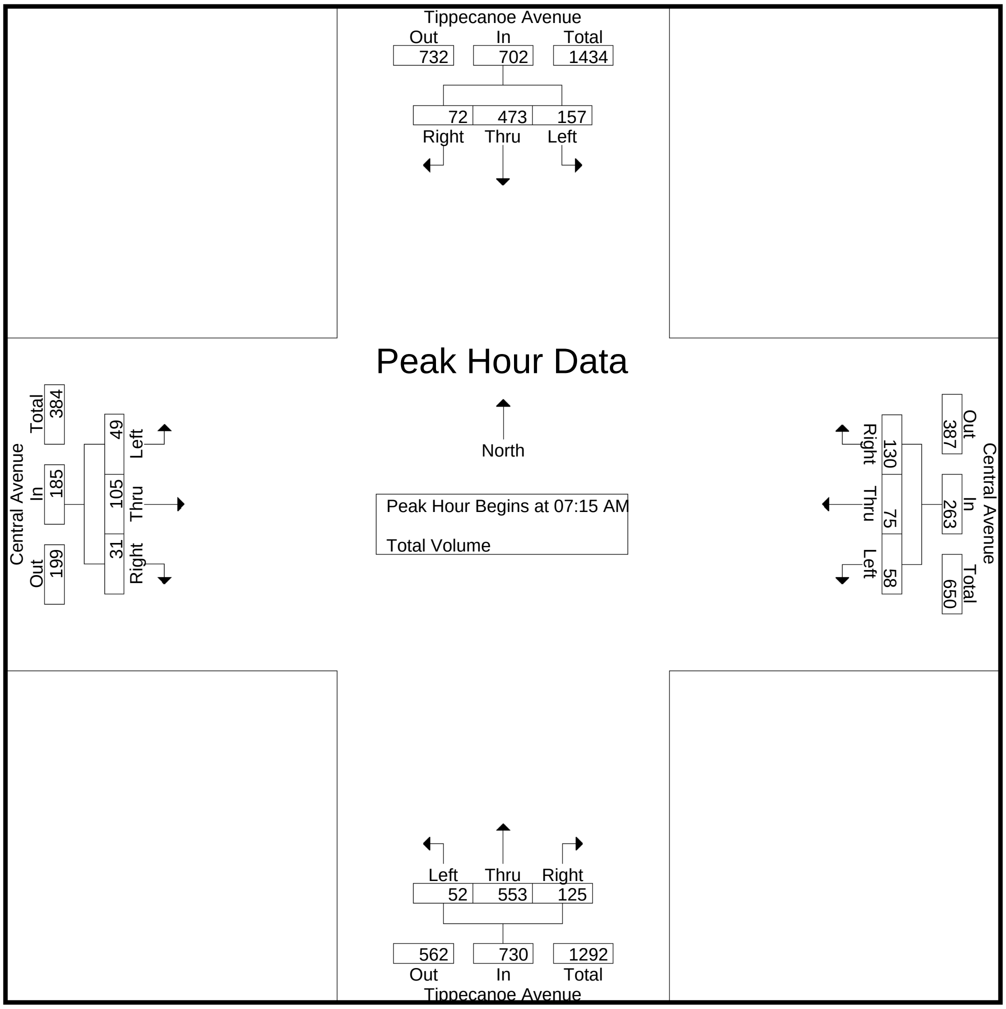

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:15 AM				07:30 AM				07:15 AM				07:15 AM			
+0 mins.	36	113	11	160	**26**	**38**	**54**	**118**	13	132	**38**	183	10	**44**	4	**58**
+15 mins.	**50**	109	**23**	**182**	9	12	27	48	**15**	119	34	168	14	21	9	44
+30 mins.	34	**130**	15	179	16	15	24	55	14	**177**	21	**212**	10	19	5	34
+45 mins.	37	121	23	181	14	9	21	44	10	125	32	167	**15**	21	**13**	49
Total Volume	157	473	72	702	65	74	126	265	52	553	125	730	49	105	31	185
% App. Total	22.4	67.4	10.3		24.5	27.9	47.5		7.1	75.8	17.1		26.5	56.8	16.8	
PHF	.785	.910	.783	.964	.625	.487	.583	.561	.867	.781	.822	.861	.817	.597	.596	.797

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Groups Printed- Total Volume

	Tippecanoe Avenue Southbound				Central Avenue Westbound				Tippecanoe Avenue Northbound				Central Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	30	156	27	213	10	21	38	69	19	197	5	221	17	9	12	38	541
04:15 PM	17	146	13	176	11	13	38	62	16	162	10	188	27	13	10	50	476
04:30 PM	43	155	30	228	19	38	42	99	8	168	9	185	20	13	8	41	553
04:45 PM	24	129	62	215	10	17	31	58	14	205	6	225	24	17	11	52	550
Total	114	586	132	832	50	89	149	288	57	732	30	819	88	52	41	181	2120
05:00 PM	39	195	36	270	18	19	38	75	14	193	5	212	27	12	10	49	606
05:15 PM	45	167	29	241	15	25	29	69	14	206	3	223	29	8	15	52	585
05:30 PM	27	137	16	180	42	53	46	141	20	149	26	195	27	26	9	62	578
05:45 PM	48	142	11	201	19	28	46	93	12	155	33	200	20	41	7	68	562
Total	159	641	92	892	94	125	159	378	60	703	67	830	103	87	41	231	2331
Grand Total	273	1227	224	1724	144	214	308	666	117	1435	97	1649	191	139	82	412	4451
Apprch %	15.8	71.2	13		21.6	32.1	46.2		7.1	87	5.9		46.4	33.7	19.9		
Total %	6.1	27.6	5	38.7	3.2	4.8	6.9	15	2.6	32.2	2.2	37	4.3	3.1	1.8	9.3	

	Tippecanoe Avenue Southbound				Central Avenue Westbound				Tippecanoe Avenue Northbound				Central Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	39	**195**	**36**	**270**	18	19	38	75	14	193	5	212	27	12	10	49	**606**
05:15 PM	45	167	29	241	15	25	29	69	14	**206**	3	**223**	**29**	8	**15**	52	585
05:30 PM	27	137	16	180	**42**	**53**	**46**	**141**	**20**	149	26	195	27	26	9	62	578
05:45 PM	**48**	142	11	201	19	28	46	93	12	155	**33**	200	20	**41**	7	**68**	562
Total Volume	159	641	92	892	94	125	159	378	60	703	67	830	103	87	41	231	2331
% App. Total	17.8	71.9	10.3		24.9	33.1	42.1		7.2	84.7	8.1		44.6	37.7	17.7		
PHF	.828	.822	.639	.826	.560	.590	.864	.670	.750	.853	.508	.930	.888	.530	.683	.849	.962

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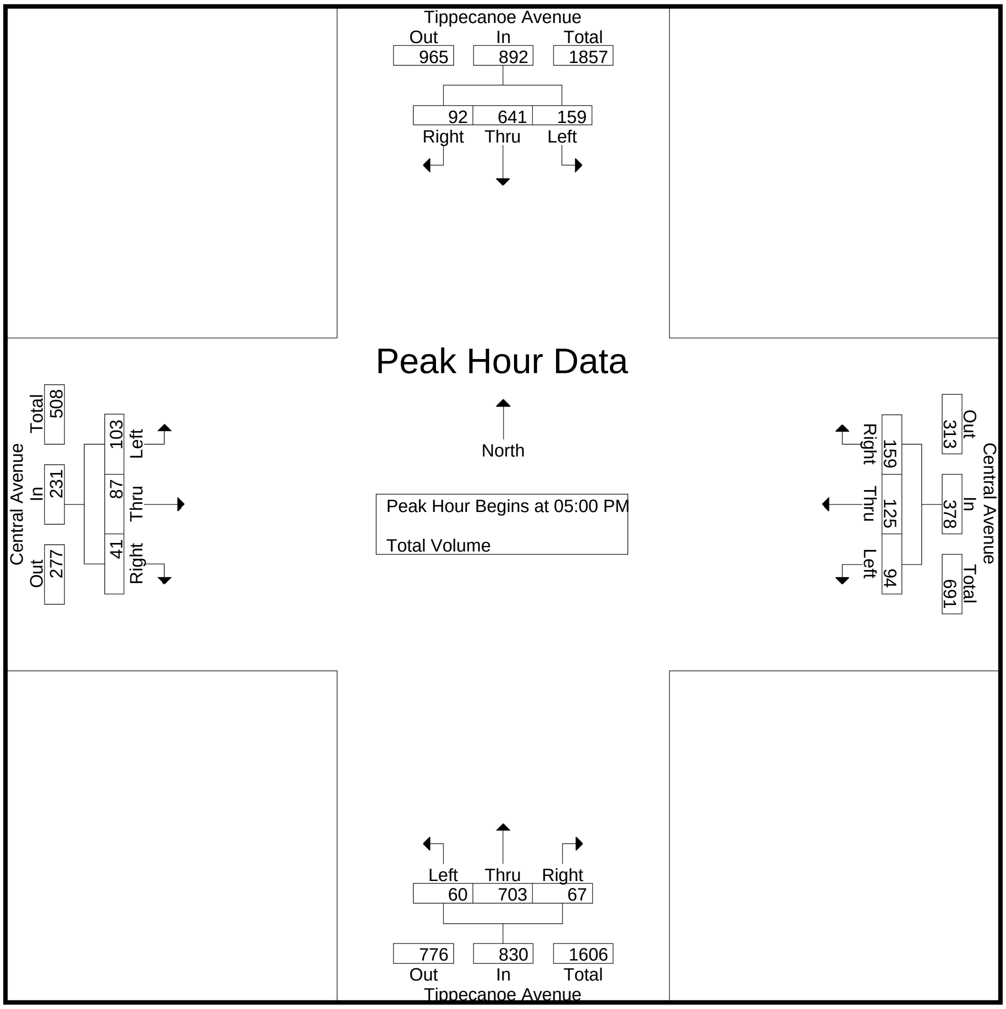
City of San Bernardino
N/S: Tippecanoe Avenue
E/W: Central Avenue
Weather: Clear

File Name : 02_SBC_Tippecanoe_Central PM
Site Code : 05721367
Start Date : 7/29/2021
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:30 PM				05:00 PM				04:45 PM				05:00 PM			
+0 mins.	43	155	30	228	18	19	38	75	14	205	6	**225**	27	12	10	49
+15 mins.	24	129	**62**	215	15	25	29	69	14	193	5	212	**29**	8	**15**	52
+30 mins.	39	**195**	36	**270**	**42**	**53**	**46**	**141**	14	**206**	3	223	27	26	9	62
+45 mins.	**45**	167	29	241	19	28	46	93	**20**	149	**26**	195	20	**41**	7	**68**
Total Volume	151	646	157	954	94	125	159	378	62	753	40	855	103	87	41	231
% App. Total	15.8	67.7	16.5		24.9	33.1	42.1		7.3	88.1	4.7		44.6	37.7	17.7	
PHF	.839	.828	.633	.883	.560	.590	.864	.670	.775	.914	.385	.950	.888	.530	.683	.849

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City of San Bernardino
N/S: Tippecanoe Avenue
E/W: Orange Show Rd/San Bernardino Ave
Weather: Clear

File Name : 03_SBC_Tippecanoe_Orange AM
Site Code : 05721367
Start Date : 7/29/2021
Page No : 1

Groups Printed- Total Volume

	Tippecanoe Avenue Southbound				San Bernardino Avenue Westbound				Tippecanoe Avenue Northbound				Orange Show Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	22	100	7	129	10	22	20	52	7	110	9	126	19	42	24	85	392
07:15 AM	24	91	11	126	10	25	24	59	16	117	13	146	26	45	19	90	421
07:30 AM	20	128	13	161	16	33	24	73	12	131	21	164	25	43	20	88	486
07:45 AM	24	124	6	154	20	24	29	73	16	172	15	203	30	42	18	90	520
Total	90	443	37	570	56	104	97	257	51	530	58	639	100	172	81	353	1819
08:00 AM	21	108	10	139	15	26	13	54	16	107	14	137	28	26	21	75	405
08:15 AM	14	90	9	113	13	31	20	64	16	119	13	148	33	22	14	69	394
08:30 AM	8	115	12	135	7	22	12	41	15	110	14	139	21	29	30	80	395
08:45 AM	26	123	7	156	7	27	24	58	15	107	14	136	14	21	15	50	400
Total	69	436	38	543	42	106	69	217	62	443	55	560	96	98	80	274	1594
Grand Total	159	879	75	1113	98	210	166	474	113	973	113	1199	196	270	161	627	3413
Apprch %	14.3	79	6.7		20.7	44.3	35		9.4	81.2	9.4		31.3	43.1	25.7		
Total %	4.7	25.8	2.2	32.6	2.9	6.2	4.9	13.9	3.3	28.5	3.3	35.1	5.7	7.9	4.7	18.4	

	Tippecanoe Avenue Southbound				San Bernardino Avenue Westbound				Tippecanoe Avenue Northbound				Orange Show Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	**24**	91	11	126	10	25	24	59	**16**	117	13	146	26	**45**	19	**90**	421
07:30 AM	20	**128**	**13**	**161**	16	**33**	24	**73**	12	131	**21**	164	25	43	20	88	486
07:45 AM	24	124	6	154	**20**	24	**29**	73	16	**172**	15	**203**	**30**	42	18	90	**520**
08:00 AM	21	108	10	139	15	26	13	54	16	107	14	137	28	26	**21**	75	405
Total Volume	89	451	40	580	61	108	90	259	60	527	63	650	109	156	78	343	1832
% App. Total	15.3	77.8	6.9		23.6	41.7	34.7		9.2	81.1	9.7		31.8	45.5	22.7		
PHF	.927	.881	.769	.901	.763	.818	.776	.887	.938	.766	.750	.800	.908	.867	.929	.953	.881

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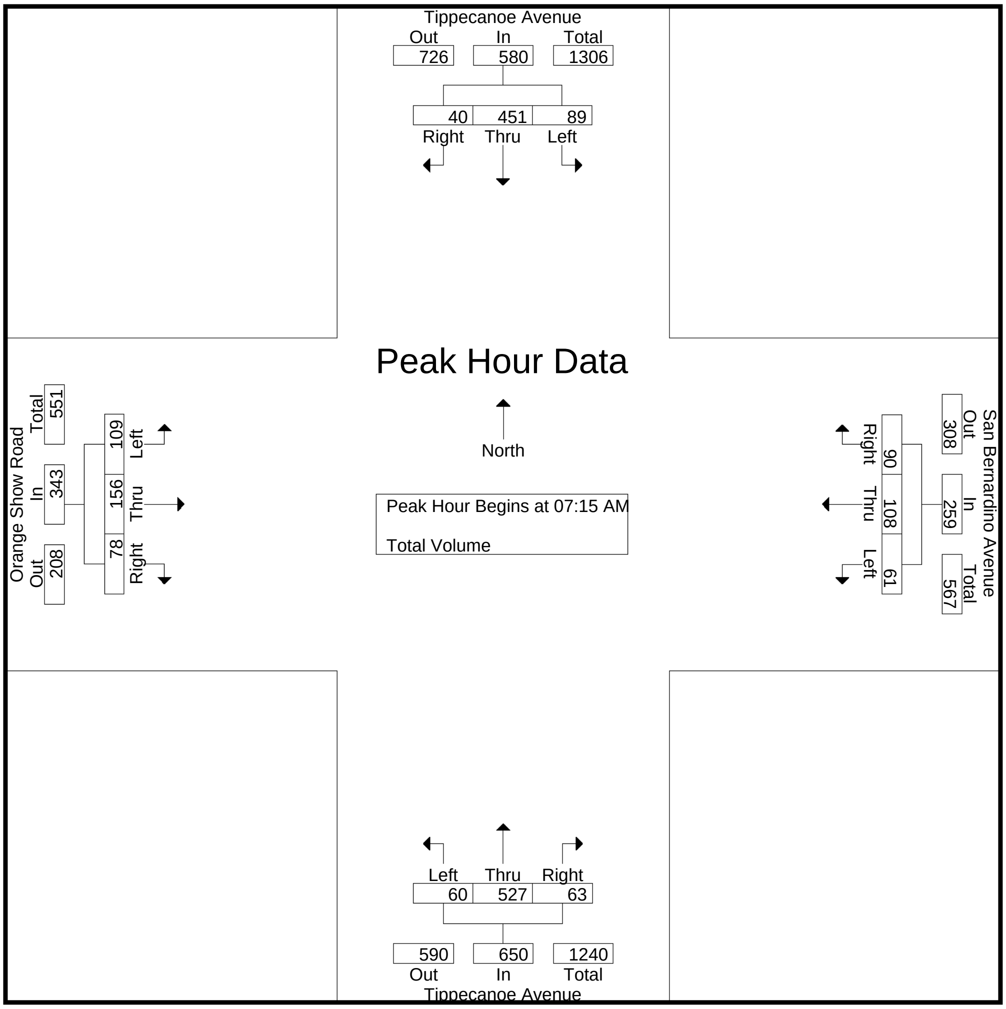
City of San Bernardino
N/S: Tippecanoe Avenue
E/W: Orange Show Rd/San Bernardino Ave
Weather: Clear

File Name : 03_SBC_Tippecanoe_Orange AM
Site Code : 05721367
Start Date : 7/29/2021
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:15 AM				07:30 AM				07:30 AM				07:00 AM			
+0 mins.	**24**	91	11	126	16	**33**	24	**73**	12	131	**21**	164	19	42	**24**	85
+15 mins.	20	**128**	**13**	**161**	**20**	24	**29**	73	**16**	**172**	15	**203**	26	**45**	19	**90**
+30 mins.	24	124	6	154	15	26	13	54	16	107	14	137	25	43	20	88
+45 mins.	21	108	10	139	13	31	20	64	16	119	13	148	**30**	42	18	90
Total Volume	89	451	40	580	64	114	86	264	60	529	63	652	100	172	81	353
% App. Total	15.3	77.8	6.9		24.2	43.2	32.6		9.2	81.1	9.7		28.3	48.7	22.9	
PHF	.927	.881	.769	.901	.800	.864	.741	.904	.938	.769	.750	.803	.833	.956	.844	.981

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City of San Bernardino
N/S: Tippecanoe Avenue
E/W: Orange Show Rd/San Bernardino Ave
Weather: Clear

File Name : 03_SBC_Tippecanoe_Orange PM
Site Code : 05721367
Start Date : 7/29/2021
Page No : 1

Groups Printed- Total Volume

	Tippecanoe Avenue Southbound				San Bernardino Avenue Westbound				Tippecanoe Avenue Northbound				Orange Show Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	30	167	14	211	30	69	44	143	19	175	22	216	21	64	18	103	673
04:15 PM	50	136	14	200	12	53	29	94	18	163	25	206	28	64	19	111	611
04:30 PM	43	167	12	222	14	76	45	135	19	155	15	189	32	78	24	134	680
04:45 PM	40	140	13	193	14	55	42	111	21	164	17	202	33	64	29	126	632
Total	163	610	53	826	70	253	160	483	77	657	79	813	114	270	90	474	2596
05:00 PM	42	185	13	240	10	62	33	105	23	180	29	232	37	89	23	149	726
05:15 PM	52	146	15	213	17	51	27	95	14	176	22	212	34	80	24	138	658
05:30 PM	52	130	19	201	14	40	34	88	24	145	21	190	37	113	26	176	655
05:45 PM	29	163	14	206	11	23	34	68	22	139	14	175	43	91	24	158	607
Total	175	624	61	860	52	176	128	356	83	640	86	809	151	373	97	621	2646
Grand Total	338	1234	114	1686	122	429	288	839	160	1297	165	1622	265	643	187	1095	5242
Apprch %	20	73.2	6.8		14.5	51.1	34.3		9.9	80	10.2		24.2	58.7	17.1		
Total %	6.4	23.5	2.2	32.2	2.3	8.2	5.5	16	3.1	24.7	3.1	30.9	5.1	12.3	3.6	20.9	

	Tippecanoe Avenue Southbound				San Bernardino Avenue Westbound				Tippecanoe Avenue Northbound				Orange Show Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	43	167	12	222	14	**76**	**45**	**135**	19	155	15	189	32	78	24	134	680
04:45 PM	40	140	13	193	14	55	42	111	21	164	17	202	33	64	**29**	126	632
05:00 PM	42	**185**	13	**240**	10	62	33	105	**23**	**180**	**29**	**232**	**37**	**89**	23	**149**	**726**
05:15 PM	**52**	146	**15**	213	**17**	51	27	95	14	176	22	212	34	80	24	138	658
Total Volume	177	638	53	868	55	244	147	446	77	675	83	835	136	311	100	547	2696
% App. Total	20.4	73.5	6.1		12.3	54.7	33		9.2	80.8	9.9		24.9	56.9	18.3		
PHF	.851	.862	.883	.904	.809	.803	.817	.826	.837	.938	.716	.900	.919	.874	.862	.918	.928

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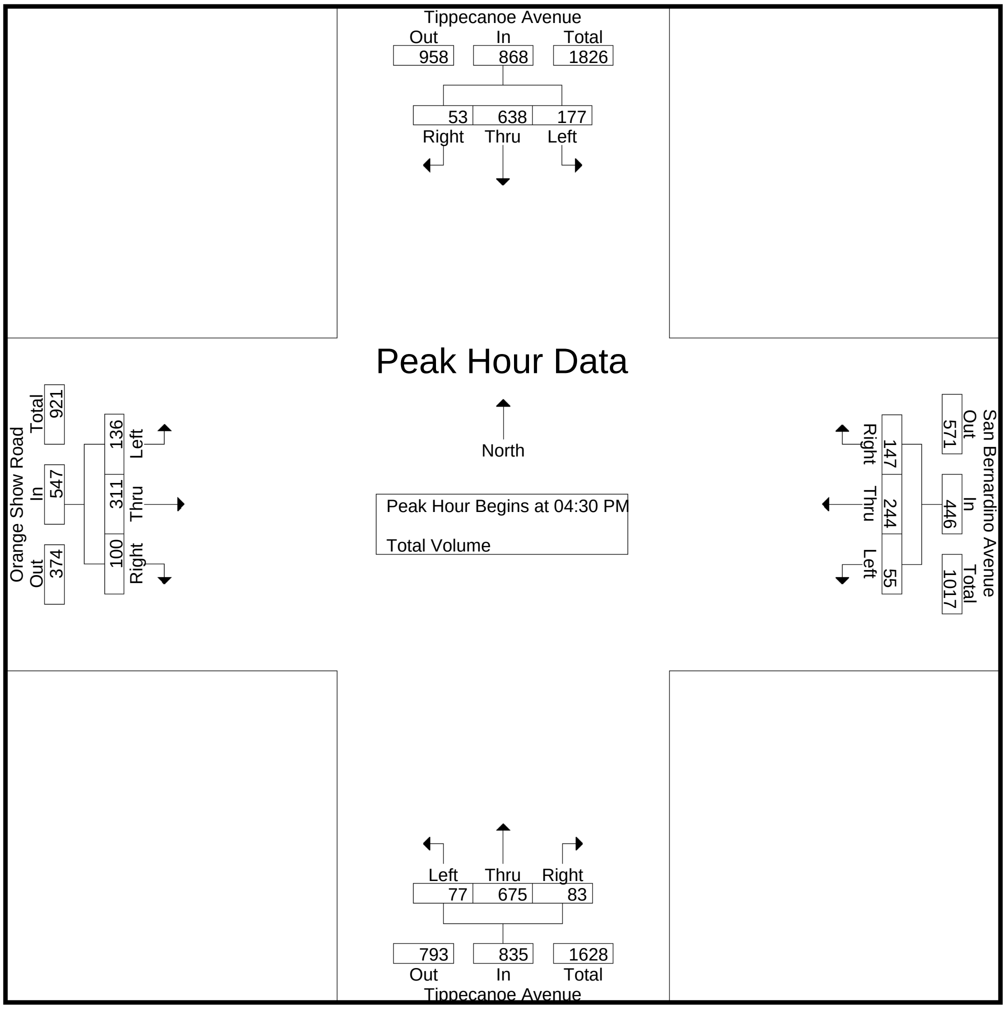
City of San Bernardino
N/S: Tippecanoe Avenue
E/W: Orange Show Rd/San Bernardino Ave
Weather: Clear

File Name : 03_SBC_Tippecanoe_Orange PM
Site Code : 05721367
Start Date : 7/29/2021
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:30 PM				04:00 PM				04:45 PM				05:00 PM			
+0 mins.	43	167	12	222	**30**	69	44	**143**	21	164	17	202	37	89	23	149
+15 mins.	40	140	13	193	12	53	29	94	23	**180**	**29**	**232**	34	80	24	138
+30 mins.	42	**185**	13	**240**	14	**76**	**45**	135	14	176	22	212	37	**113**	**26**	**176**
+45 mins.	**52**	146	**15**	213	14	55	42	111	**24**	145	21	190	**43**	91	24	158
Total Volume	177	638	53	868	70	253	160	483	82	665	89	836	151	373	97	621
% App. Total	20.4	73.5	6.1		14.5	52.4	33.1		9.8	79.5	10.6		24.3	60.1	15.6	
PHF	.851	.862	.883	.904	.583	.832	.889	.844	.854	.924	.767	.901	.878	.825	.933	.882

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City of San Bernardino
N/S: Tippecanoe Avenue
E/W: Harriman Pl/I-10 Westbound Ramps
Weather: Clear

File Name : 08_SBC_Tippecanoe_Harriman_10W AM
Site Code : 99919369
Start Date : 5/23/2019
Page No : 1

Groups Printed- Passenger Vehicles - Large 2 Axle Vehicles - 3 Axle Vehicles - 4+ Axle Trucks

	Tippecanoe Avenue Southbound				I-10 Westbound Ramps Westbound				Tippecanoe Avenue Northbound				Harriman Place Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	0	135	6	141	100	31	89	220	18	162	69	249	5	0	49	54	664
07:15 AM	0	172	13	185	124	29	81	234	26	154	82	262	12	0	40	52	733
07:30 AM	0	157	8	165	161	30	75	266	27	156	88	271	7	0	45	52	754
07:45 AM	0	178	21	199	146	32	84	262	38	180	89	307	16	0	50	66	834
Total	0	642	48	690	531	122	329	982	109	652	328	1089	40	0	184	224	2985
08:00 AM	0	183	8	191	116	55	79	250	42	169	98	309	7	0	45	52	802
08:15 AM	0	181	23	204	101	36	88	225	57	174	85	316	14	0	59	73	818
08:30 AM	0	168	9	177	94	38	77	209	45	141	70	256	13	1	58	72	714
08:45 AM	0	162	15	177	83	46	63	192	44	169	59	272	10	0	57	67	708
Total	0	694	55	749	394	175	307	876	188	653	312	1153	44	1	219	264	3042
Grand Total	0	1336	103	1439	925	297	636	1858	297	1305	640	2242	84	1	403	488	6027
Apprch %	0	92.8	7.2		49.8	16	34.2		13.2	58.2	28.5		17.2	0.2	82.6		
Total %	0	22.2	1.7	23.9	15.3	4.9	10.6	30.8	4.9	21.7	10.6	37.2	1.4	0	6.7	8.1	
Passenger Vehicles	0	1201	103	1304	913	292	623	1828	294	1170	616	2080	80	0	393	473	5685
% Passenger Vehicles	0	89.9	100	90.6	98.7	98.3	98	98.4	99	89.7	96.2	92.8	95.2	0	97.5	96.9	94.3
Large 2 Axle Vehicles	0	41	0	41	4	3	6	13	2	42	20	64	4	0	8	12	130
% Large 2 Axle Vehicles	0	3.1	0	2.8	0.4	1	0.9	0.7	0.7	3.2	3.1	2.9	4.8	0	2	2.5	2.2
3 Axle Vehicles	0	26	0	26	2	1	1	4	0	17	0	17	0	1	0	1	48
% 3 Axle Vehicles	0	1.9	0	1.8	0.2	0.3	0.2	0.2	0	1.3	0	0.8	0	100	0	0.2	0.8
4+ Axle Trucks	0	68	0	68	6	1	6	13	1	76	4	81	0	0	2	2	164
% 4+ Axle Trucks	0	5.1	0	4.7	0.6	0.3	0.9	0.7	0.3	5.8	0.6	3.6	0	0	0.5	0.4	2.7

	Tippecanoe Avenue Southbound				I-10 Westbound Ramps Westbound				Tippecanoe Avenue Northbound				Harriman Place Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	0	157	8	165	**161**	30	75	**266**	27	156	88	271	7	0	45	52	754
07:45 AM	0	178	21	199	146	32	84	262	38	**180**	89	307	**16**	0	50	66	**834**
08:00 AM	0	**183**	8	191	116	**55**	79	250	42	169	**98**	309	7	0	45	52	802
08:15 AM	0	181	**23**	**204**	101	36	**88**	225	**57**	174	85	**316**	14	0	**59**	**73**	818
Total Volume	0	699	60	759	524	153	326	1003	164	679	360	1203	44	0	199	243	3208
% App. Total	0	92.1	7.9		52.2	15.3	32.5		13.6	56.4	29.9		18.1	0	81.9		
PHF	.000	.955	.652	.930	.814	.695	.926	.943	.719	.943	.918	.952	.688	.000	.843	.832	.962

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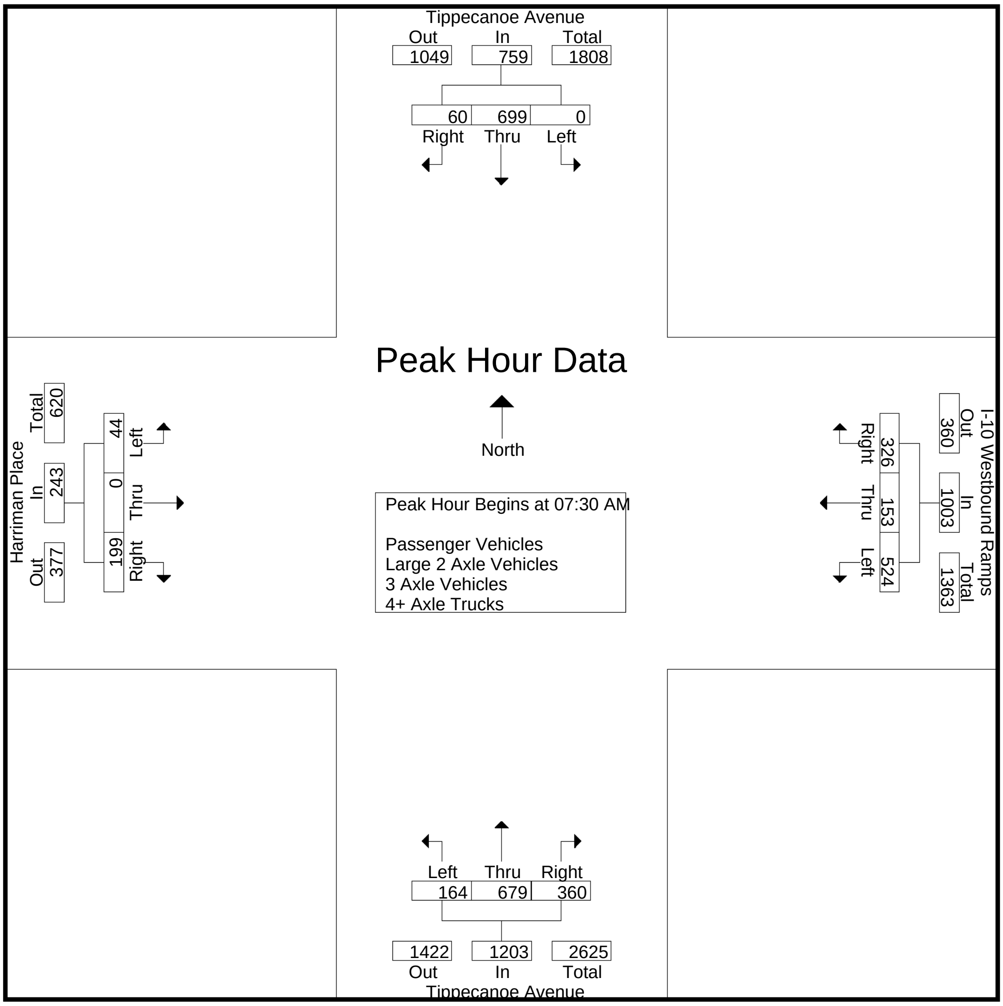
City of San Bernardino
N/S: Tippecanoe Avenue
E/W: Harriman Pl/I-10 Westbound Ramps
Weather: Clear

File Name : 08_SBC_Tippecanoe_Harriman_10W AM
Site Code : 99919369
Start Date : 5/23/2019
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:45 AM				07:15 AM				07:30 AM				08:00 AM			
+0 mins.	0	178	21	199	124	29	81	234	27	156	88	271	7	0	45	52
+15 mins.	0	**183**	8	191	**161**	30	75	**266**	38	**180**	89	307	**14**	0	**59**	**73**
+30 mins.	0	181	**23**	**204**	146	32	**84**	262	42	169	**98**	309	13	**1**	58	72
+45 mins.	0	168	9	177	116	**55**	79	250	**57**	174	85	**316**	10	0	57	67
Total Volume	0	710	61	771	547	146	319	1012	164	679	360	1203	44	1	219	264
% App. Total	0	92.1	7.9		54.1	14.4	31.5		13.6	56.4	29.9		16.7	0.4	83	
PHF	.000	.970	.663	.945	.849	.664	.949	.951	.719	.943	.918	.952	.786	.250	.928	.904

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City of San Bernardino
N/S: Tippecanoe Avenue
E/W: Harriman Pl/I-10 Westbound Ramps
Weather: Clear

File Name : 08_SBC_Tippecanoe_Harriman_10W PM
Site Code : 99919369
Start Date : 5/23/2019
Page No : 1

Groups Printed- Passenger Vehicles - Large 2 Axle Vehicles - 3 Axle Vehicles - 4+ Axle Trucks

	Tippecanoe Avenue Southbound				I-10 Westbound Ramps Westbound				Tippecanoe Avenue Northbound				Harriman Place Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	0	290	40	330	44	64	80	188	72	136	124	332	41	0	153	194	1044
04:15 PM	0	258	47	305	43	60	74	177	88	175	134	397	41	0	140	181	1060
04:30 PM	0	264	43	307	61	45	85	191	75	142	132	349	37	0	147	184	1031
04:45 PM	0	262	42	304	65	70	87	222	74	167	171	412	29	0	155	184	1122
Total	0	1074	172	1246	213	239	326	778	309	620	561	1490	148	0	595	743	4257
05:00 PM	0	264	32	296	49	32	74	155	52	123	114	289	50	0	182	232	972
05:15 PM	0	258	36	294	57	46	77	180	57	157	135	349	48	0	150	198	1021
05:30 PM	0	213	49	262	93	57	82	232	58	132	78	268	40	0	167	207	969
05:45 PM	0	210	40	250	80	19	81	180	51	147	81	279	39	0	155	194	903
Total	0	945	157	1102	279	154	314	747	218	559	408	1185	177	0	654	831	3865
Grand Total	0	2019	329	2348	492	393	640	1525	527	1179	969	2675	325	0	1249	1574	8122
Apprch %	0	86	14		32.3	25.8	42		19.7	44.1	36.2		20.6	0	79.4		
Total %	0	24.9	4.1	28.9	6.1	4.8	7.9	18.8	6.5	14.5	11.9	32.9	4	0	15.4	19.4	
Passenger Vehicles	0	1924	329	2253	482	393	622	1497	525	1108	955	2588	325	0	1248	1573	7911
% Passenger Vehicles	0	95.3	100	96	98	100	97.2	98.2	99.6	94	98.6	96.7	100	0	99.9	99.9	97.4
Large 2 Axle Vehicles	0	30	0	30	5	0	10	15	1	27	9	37	0	0	1	1	83
% Large 2 Axle Vehicles	0	1.5	0	1.3	1	0	1.6	1	0.2	2.3	0.9	1.4	0	0	0.1	0.1	1
3 Axle Vehicles	0	17	0	17	1	0	2	3	0	10	2	12	0	0	0	0	32
% 3 Axle Vehicles	0	0.8	0	0.7	0.2	0	0.3	0.2	0	0.8	0.2	0.4	0	0	0	0	0.4
4+ Axle Trucks	0	48	0	48	4	0	6	10	1	34	3	38	0	0	0	0	96
% 4+ Axle Trucks	0	2.4	0	2	0.8	0	0.9	0.7	0.2	2.9	0.3	1.4	0	0	0	0	1.2

	Tippecanoe Avenue Southbound				I-10 Westbound Ramps Westbound				Tippecanoe Avenue Northbound				Harriman Place Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	**290**	40	**330**	44	64	80	188	72	136	124	332	**41**	0	153	**194**	1044
04:15 PM	0	258	**47**	305	43	60	74	177	**88**	**175**	134	397	41	0	140	181	1060
04:30 PM	0	264	43	307	61	45	85	191	75	142	132	349	37	0	147	184	1031
04:45 PM	0	262	42	304	**65**	**70**	**87**	**222**	74	167	**171**	**412**	29	0	**155**	184	**1122**
Total Volume	0	1074	172	1246	213	239	326	778	309	620	561	1490	148	0	595	743	4257
% App. Total	0	86.2	13.8		27.4	30.7	41.9		20.7	41.6	37.7		19.9	0	80.1		
PHF	.000	.926	.915	.944	.819	.854	.937	.876	.878	.886	.820	.904	.902	.000	.960	.957	.949

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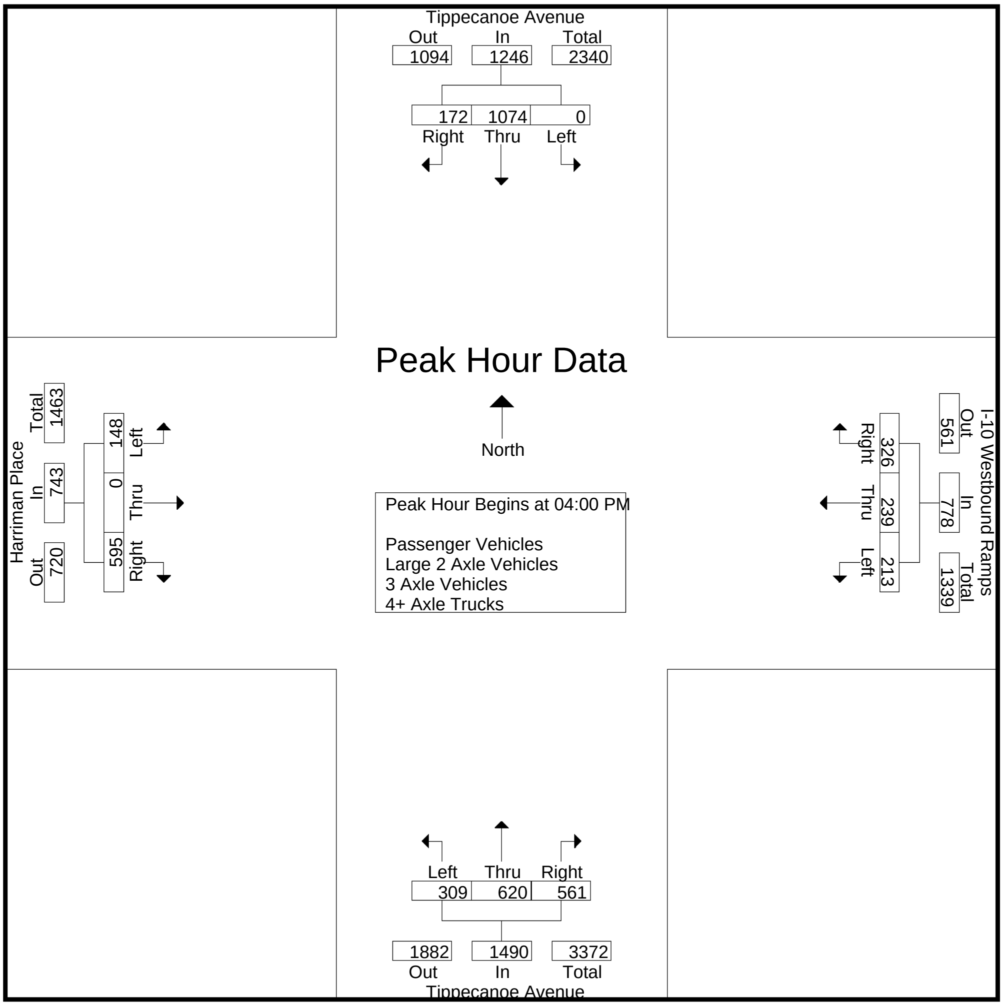
City of San Bernardino
N/S: Tippecanoe Avenue
E/W: Harriman Pl/I-10 Westbound Ramps
Weather: Clear

File Name : 08_SBC_Tippecanoe_Harriman_10W PM
Site Code : 99919369
Start Date : 5/23/2019
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:00 PM				04:45 PM				04:00 PM				05:00 PM			
+0 mins.	0	**290**	40	**330**	65	**70**	**87**	222	72	136	124	332	**50**	0	**182**	**232**
+15 mins.	0	258	**47**	305	49	32	74	155	**88**	**175**	134	397	48	0	150	198
+30 mins.	0	264	43	307	57	46	77	180	75	142	132	349	40	0	167	207
+45 mins.	0	262	42	304	**93**	57	82	**232**	74	167	**171**	**412**	39	0	155	194
Total Volume	0	1074	172	1246	264	205	320	789	309	620	561	1490	177	0	654	831
% App. Total	0	86.2	13.8		33.5	26	40.6		20.7	41.6	37.7		21.3	0	78.7	
PHF	.000	.926	.915	.944	.710	.732	.920	.850	.878	.886	.820	.904	.885	.000	.898	.895

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City of San Bernardino
N/S: Tippecanoe Avenue
E/W: I-10 Eastbound Ramps
Weather: Clear

File Name : 09_SBC_Anderson_10E AM
Site Code : 99919369
Start Date : 5/23/2019
Page No : 1

Groups Printed- Passenger Vehicles - Large 2 Axle Vehicles - 3 Axle Vehicles - 4+ Axle Trucks

	Anderson Street Southbound				I-10 Eastbound On Ramp Westbound				Anderson Street Northbound				I-10 Eastbound Off Ramp Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	33	150	0	183	0	0	0	0	0	135	47	182	116	2	127	245	610
07:15 AM	29	176	0	205	0	0	0	0	0	131	40	171	122	2	142	266	642
07:30 AM	36	186	0	222	0	0	0	0	0	137	68	205	148	2	170	320	747
07:45 AM	49	223	0	272	0	0	0	0	0	156	80	236	148	1	172	321	829
Total	147	735	0	882	0	0	0	0	0	559	235	794	534	7	611	1152	2828
08:00 AM	44	200	0	244	0	0	0	0	0	157	77	234	149	0	146	295	773
08:15 AM	55	178	0	233	0	0	0	0	0	172	62	234	137	0	147	284	751
08:30 AM	58	161	0	219	0	0	0	0	0	129	57	186	130	2	160	292	697
08:45 AM	60	166	0	226	0	0	0	0	0	151	49	200	117	1	132	250	676
Total	217	705	0	922	0	0	0	0	0	609	245	854	533	3	585	1121	2897
Grand Total	364	1440	0	1804	0	0	0	0	0	1168	480	1648	1067	10	1196	2273	5725
Apprch %	20.2	79.8	0		0	0	0		0	70.9	29.1		46.9	0.4	52.6		
Total %	6.4	25.2	0	31.5	0	0	0	0	0	20.4	8.4	28.8	18.6	0.2	20.9	39.7	
Passenger Vehicles	344	1399	0	1743	0	0	0	0	0	1097	469	1566	976	3	1157	2136	5445
% Passenger Vehicles	94.5	97.2	0	96.6	0	0	0	0	0	93.9	97.7	95	91.5	30	96.7	94	95.1
Large 2 Axle Vehicles	14	18	0	32	0	0	0	0	0	40	9	49	22	7	29	58	139
% Large 2 Axle Vehicles	3.8	1.2	0	1.8	0	0	0	0	0	3.4	1.9	3	2.1	70	2.4	2.6	2.4
3 Axle Vehicles	0	14	0	14	0	0	0	0	0	8	1	9	11	0	6	17	40
% 3 Axle Vehicles	0	1	0	0.8	0	0	0	0	0	0.7	0.2	0.5	1	0	0.5	0.7	0.7
4+ Axle Trucks	6	9	0	15	0	0	0	0	0	23	1	24	58	0	4	62	101
% 4+ Axle Trucks	1.6	0.6	0	0.8	0	0	0	0	0	2	0.2	1.5	5.4	0	0.3	2.7	1.8

	Anderson Street Southbound				I-10 Eastbound On Ramp Westbound				Anderson Street Northbound				I-10 Eastbound Off Ramp Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	36	186	0	222	0	0	0	0	0	137	68	205	148	**2**	170	320	747
07:45 AM	49	**223**	0	**272**	0	0	0	0	0	156	**80**	**236**	148	1	**172**	**321**	**829**
08:00 AM	44	200	0	244	0	0	0	0	0	157	77	234	**149**	0	146	295	773
08:15 AM	**55**	178	0	233	0	0	0	0	0	**172**	62	234	137	0	147	284	751
Total Volume	184	787	0	971	0	0	0	0	0	622	287	909	582	3	635	1220	3100
% App. Total	18.9	81.1	0		0	0	0		0	68.4	31.6		47.7	0.2	52		
PHF	.836	.882	.000	.892	.000	.000	.000	.000	.000	.904	.897	.963	.977	.375	.923	.950	.935

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City of San Bernardino
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E/W: I-10 Eastbound Ramps
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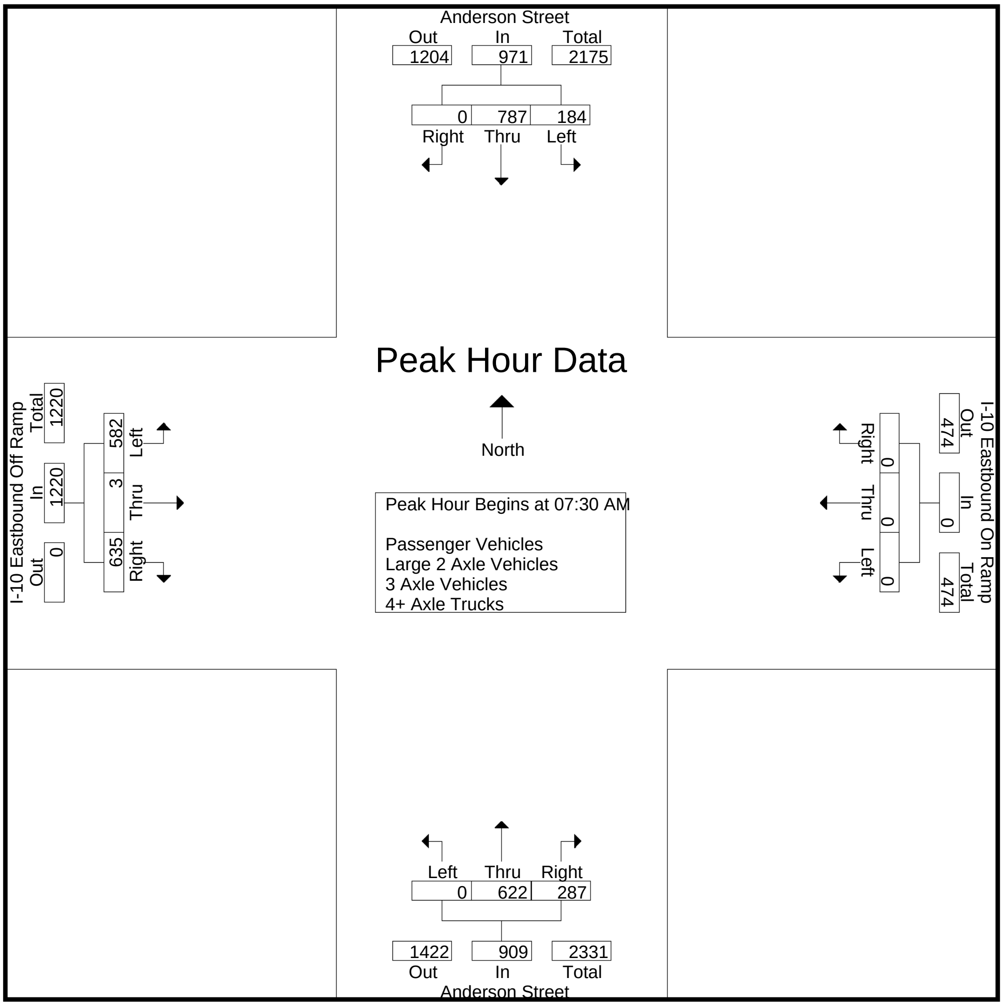
File Name : 09_SBC_Anderson_10E AM
Site Code : 99919369
Start Date : 5/23/2019
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:30 AM				07:00 AM				07:30 AM				07:30 AM			
+0 mins.	36	186	0	222	0	0	0	0	0	137	68	205	148	**2**	170	320
+15 mins.	49	**223**	0	**272**	0	0	0	0	0	156	**80**	**236**	148	1	**172**	**321**
+30 mins.	44	200	0	244	0	0	0	0	0	157	77	234	**149**	0	146	295
+45 mins.	**55**	178	0	233	0	0	0	0	0	**172**	62	234	137	0	147	284
Total Volume	184	787	0	971	0	0	0	0	0	622	287	909	582	3	635	1220
% App. Total	18.9	81.1	0		0	0	0		0	68.4	31.6		47.7	0.2	52	
PHF	.836	.882	.000	.892	.000	.000	.000	.000	.000	.904	.897	.963	.977	.375	.923	.950

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File Name : 09_SBC_Anderson_10E PM
Site Code : 99919369
Start Date : 5/23/2019
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Groups Printed- Passenger Vehicles - Large 2 Axle Vehicles - 3 Axle Vehicles - 4+ Axle Trucks

	Anderson Street Southbound				I-10 Eastbound On Ramp Westbound				Anderson Street Northbound				I-10 Eastbound Off Ramp Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	152	200	0	352	0	0	0	0	0	261	76	337	94	1	58	153	842
04:15 PM	149	187	0	336	0	0	0	0	0	300	81	381	77	1	77	155	872
04:30 PM	137	203	0	340	0	0	0	0	0	259	87	346	103	1	71	175	861
04:45 PM	154	178	0	332	0	0	0	0	0	290	92	382	90	0	83	173	887
Total	592	768	0	1360	0	0	0	0	0	1110	336	1446	364	3	289	656	3462
05:00 PM	158	158	0	316	0	0	0	0	0	246	83	329	83	2	70	155	800
05:15 PM	146	170	0	316	0	0	0	0	0	245	47	292	86	1	75	162	770
05:30 PM	131	169	0	300	0	0	0	0	0	202	82	284	83	0	82	165	749
05:45 PM	118	162	0	280	0	0	0	0	0	195	72	267	88	1	65	154	701
Total	553	659	0	1212	0	0	0	0	0	888	284	1172	340	4	292	636	3020
Grand Total	1145	1427	0	2572	0	0	0	0	0	1998	620	2618	704	7	581	1292	6482
Apprch %	44.5	55.5	0		0	0	0		0	76.3	23.7		54.5	0.5	45		
Total %	17.7	22	0	39.7	0	0	0	0	0	30.8	9.6	40.4	10.9	0.1	9	19.9	
Passenger Vehicles	1135	1386	0	2521	0	0	0	0	0	1966	615	2581	649	7	572	1228	6330
% Passenger Vehicles	99.1	97.1	0	98	0	0	0	0	0	98.4	99.2	98.6	92.2	100	98.5	95	97.7
Large 2 Axle Vehicles	4	13	0	17	0	0	0	0	0	20	2	22	18	0	4	22	61
% Large 2 Axle Vehicles	0.3	0.9	0	0.7	0	0	0	0	0	1	0.3	0.8	2.6	0	0.7	1.7	0.9
3 Axle Vehicles	0	11	0	11	0	0	0	0	0	7	3	10	4	0	2	6	27
% 3 Axle Vehicles	0	0.8	0	0.4	0	0	0	0	0	0.4	0.5	0.4	0.6	0	0.3	0.5	0.4
4+ Axle Trucks	6	17	0	23	0	0	0	0	0	5	0	5	33	0	3	36	64
% 4+ Axle Trucks	0.5	1.2	0	0.9	0	0	0	0	0	0.3	0	0.2	4.7	0	0.5	2.8	1

	Anderson Street Southbound				I-10 Eastbound On Ramp Westbound				Anderson Street Northbound				I-10 Eastbound Off Ramp Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	152	200	0	**352**	0	0	0	0	0	261	76	337	94	**1**	58	153	842
04:15 PM	149	187	0	336	0	0	0	0	0	**300**	81	381	77	1	77	155	872
04:30 PM	137	**203**	0	340	0	0	0	0	0	259	87	346	**103**	1	71	**175**	861
04:45 PM	**154**	178	0	332	0	0	0	0	0	290	**92**	**382**	90	0	**83**	173	**887**
Total Volume	592	768	0	1360	0	0	0	0	0	1110	336	1446	364	3	289	656	3462
% App. Total	43.5	56.5	0		0	0	0		0	76.8	23.2		55.5	0.5	44.1		
PHF	.961	.946	.000	.966	.000	.000	.000	.000	.000	.925	.913	.946	.883	.750	.870	.937	.976

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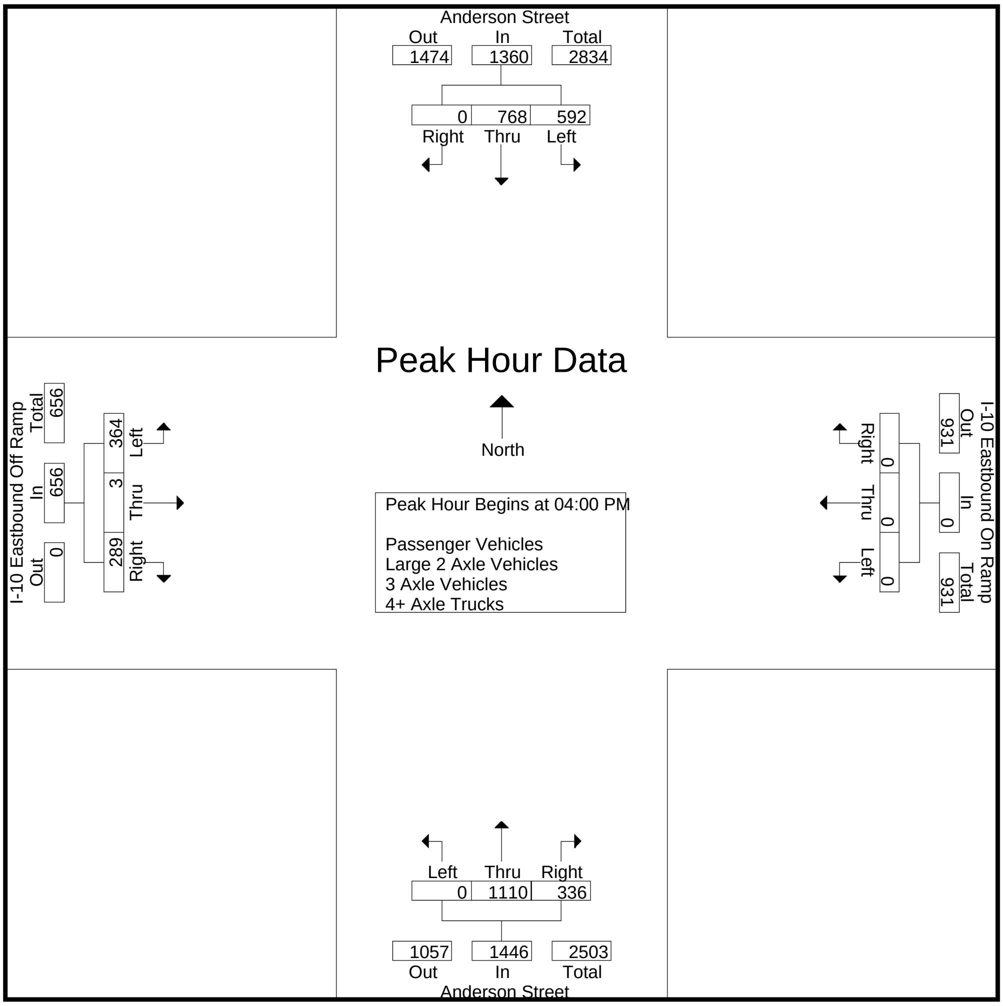


Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:00 PM				04:00 PM				04:00 PM				04:30 PM			
+0 mins.	152	200	0	**352**	0	0	0	0	0	261	76	337	**103**	1	71	**175**
+15 mins.	149	187	0	336	0	0	0	0	0	**300**	81	381	90	0	**83**	173
+30 mins.	137	**203**	0	340	0	0	0	0	0	259	87	346	83	**2**	70	155
+45 mins.	**154**	178	0	332	0	0	0	0	0	290	**92**	**382**	86	1	75	162
Total Volume	592	768	0	1360	0	0	0	0	0	1110	336	1446	362	4	299	665
% App. Total	43.5	56.5	0		0	0	0		0	76.8	23.2		54.4	0.6	45	
PHF	.961	.946	.000	.966	.000	.000	.000	.000	.000	.925	.913	.946	.879	.500	.901	.950

Intersection #4: Tippecanoe Avenue at Harriman Place/I-10 Westbound Ramps

	5/23/2019 AM Pk. Hr.	Hist. 2019 Counts to Year 2021 AM Pk. Hr.	3/24/2021 AM Pk. Hr.	Diff. Btwn Adj. Hist. 2021 & Mar. 2021 Counts	Percent Decrease from Adj. 2021 Counts	Growth Factor for Mar. 2021 to Adj. 2021 Counts	*5/23/2019 PM Pk. Hr.*	Hist. 2019 Counts to Year 2021 PM Pk. Hr.	3/24/2021 PM Pk. Hr.	Diff. Btwn Adj. Hist. 2021 & Mar. 2021 Counts	Percent Decrease from Adj. 2021 Counts	Growth Factor for Mar. 2021 to Adj. 2021 Counts
Nb Left	*164*	174	71	-103	-59.20%	245.07%	*309*	328	286	-42	-12.80%	114.69%
Nb Thru	*679*	720	612	-108	-15.00%	117.65%	*620*	657	659	2	0.30%	99.70%
Nb Right	*360*	382	278	-104	-27.23%	137.41%	*561*	595	430	-165	-27.73%	138.37%
Sb Left	*0*	0	0	0	#DIV/0!	#DIV/0!	*0*	0	0	0	#DIV/0!	#DIV/0!
Sb Thru	*699*	741	322	-419	-56.55%	230.12%	*1074*	1138	695	-443	-38.93%	163.74%
Sb Right	*60*	64	26	-38	-59.38%	246.15%	*172*	182	135	-47	-25.82%	134.81%
Eb Left	*44*	47	20	-27	-57.45%	235.00%	*148*	157	157	0	0.00%	100.00%
Eb Thru	*0*	0	0	0	#DIV/0!	#DIV/0!	*0*	0	0	0	#DIV/0!	#DIV/0!
Eb Right	*199*	211	112	-99	-46.92%	188.39%	*595*	631	586	-45	-7.13%	107.68%
Wb Left	*524*	555	360	-195	-35.14%	154.17%	*213*	226	180	-46	-20.35%	125.56%
Wb Thru	*153*	162	110	-52	-32.10%	147.27%	*239*	253	201	-52	-20.55%	125.87%
Wb Right	*326*	346	338	-8	-2.31%	102.37%	*326*	346	271	-75	-21.68%	127.68%
	3208	**3402**	**2249**	**-1153**	**-33.89%**	**151.27%**	***4257***	**4513**	**3600**	**-913**	**-20.23%**	**125.36%**

APPENDIX C

EXISTING TRAFFIC CONDITIONS
INTERSECTION LEVEL OF SERVICE
CALCULATION WORKSHEETS

APPENDIX C-I

EXISTING TRAFFIC CONDITIONS

Intersection Level Of Service Report
Intersection 1: Tippecanoe Avenue at Mill Street

Control Type:	Signalized	Delay (sec / veh):	19.7
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.518

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Mill Street			Mill Street		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			No			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Mill Street			Mill Street		
Base Volume Input [veh/h]	174	861	0	14	892	103	157	15	147	23	11	2
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	174	861	0	14	892	103	157	15	147	23	11	2
Peak Hour Factor	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	50	248	0	4	257	30	45	4	42	7	3	1
Total Analysis Volume [veh/h]	200	991	0	16	1026	119	181	17	169	26	13	2
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Permi	Protec	Permi	Overla	Split	Split	Overla	Split	Split	Split
Signal Group	1	6	0	5	2	2	0	8	8	0	4	0
Auxiliary Signal Groups						2,8			1,8			
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	5	8	0	5	8	8	0	8	8	0	8	0
Maximum Green [s]	30	30	0	30	30	30	0	30	30	0	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	0.0
Split [s]	26	52	0	9	35	35	0	47	47	0	12	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	7	0	7	7	0	0	0
Pedestrian Clearance [s]	0	41	0	0	24	24	0	36	36	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	0.0
Minimum Recall	No	No		No	No	No		No	No		No	
Maximum Recall	No	No		No	No	No		No	No		No	
Pedestrian Recall	No	No		No	No	No		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	R	L	C	R	L	C	R
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	17	85	85	2	70	95	10	10	32	6	6	6
g / C, Green / Cycle	0.14	0.71	0.71	0.02	0.59	0.79	0.09	0.09	0.26	0.05	0.05	0.05
(v / s)_i Volume / Saturation Flow Rate	0.13	0.19	0.19	0.01	0.21	0.08	0.06	0.06	0.11	0.02	0.00	0.00
s, saturation flow rate [veh/h]	1593	3373	1772	1593	4826	1506	1593	1607	1506	1593	3373	1506
c, Capacity [veh/h]	229	2399	1260	28	2825	1189	140	141	398	80	169	75
d1, Uniform Delay [s]	50.33	6.19	6.19	58.50	13.10	2.88	53.26	53.26	36.57	55.05	54.36	54.23
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	10.00	0.28	0.53	16.65	0.36	0.17	6.41	6.35	0.72	2.34	0.19	0.14
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.87	0.27	0.27	0.57	0.36	0.10	0.71	0.71	0.42	0.33	0.08	0.03
d, Delay for Lane Group [s/veh]	60.33	6.47	6.72	75.15	13.46	3.05	59.67	59.61	37.29	57.39	54.55	54.37
Lane Group LOS	E	A	A	E	B	A	E	E	D	E	D	D
Critical Lane Group	Yes	No	No	No	Yes	No	No	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	6.51	2.80	3.03	0.61	4.84	0.59	3.14	3.17	4.20	0.81	0.19	0.06
50th-Percentile Queue Length [ft/ln]	162.6	69.93	75.65	15.33	120.9	14.71	78.58	79.13	104.9	20.32	4.81	1.51
95th-Percentile Queue Length [veh/ln]	10.69	5.03	5.45	1.10	8.45	1.06	5.66	5.70	7.56	1.46	0.35	0.11
95th-Percentile Queue Length [ft/ln]	267.2	125.8	136.1	27.60	211.1	26.48	141.4	142.4	188.9	36.57	8.66	2.73

Movement, Approach, & Intersection Results

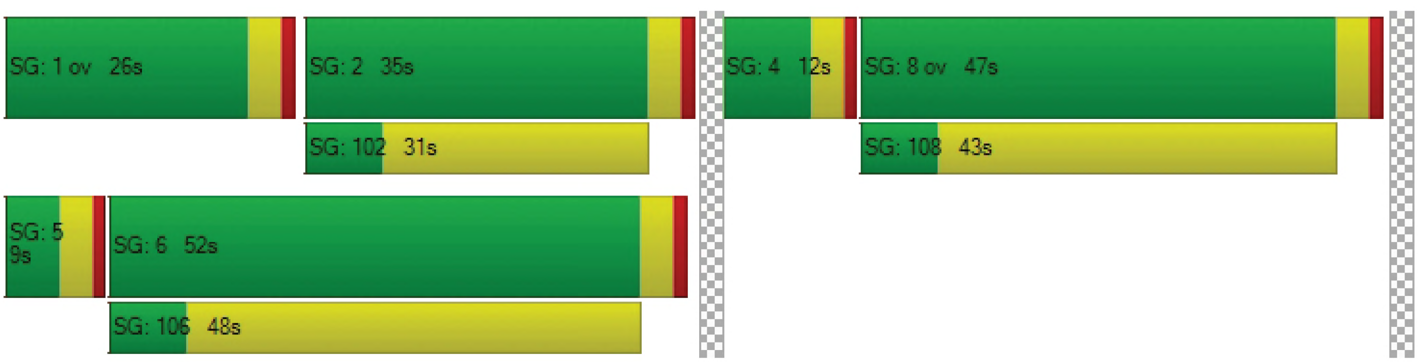
d_M, Delay for Movement [s/veh]	60.33	6.56	6.72	75.15	13.46	3.05	59.64	59.61	37.29	57.39	54.55	54.37
Movement LOS	E	A	A	E	B	A	E	E	D	E	D	D
d_A, Approach Delay [s/veh]	15.59			13.25			49.34			56.34		
Approach LOS	B			B			D			E		
d_I, Intersection Delay [s/veh]	19.70											
Intersection LOS	B											
Intersection V/C	0.518											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.51	0.00	49.51	49.51
I_p,int, Pedestrian LOS Score for Intersection	2.944	0.000	2.450	2.328
Crosswalk LOS	C	F	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	800	517	717	133
d_b, Bicycle Delay [s]	21.61	33.01	24.71	52.27
I_b,int, Bicycle LOS Score for Intersection	2.215	2.198	2.165	1.593
Bicycle LOS	B	B	B	A

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Tippecanoe Avenue at Central Avenue

Control Type:	Signalized	Delay (sec / veh):	25.2
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.514

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Central Avenue			Central Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Central Avenue			Central Avenue		
Base Volume Input [veh/h]	79	837	189	237	716	109	74	159	47	88	113	197
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	79	837	189	237	716	109	74	159	47	88	113	197
Peak Hour Factor	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	22	228	51	65	195	30	20	43	13	24	31	54
Total Analysis Volume [veh/h]	86	912	206	258	780	119	81	173	51	96	123	215
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Overla	Protec	Permi	Overla	Protec	Permi	Overla	Protec	Permi	Overla
Signal Group	1	6	6	5	2	2	3	8	8	7	4	4
Auxiliary Signal Groups			6,7			2,3			1,8			4,5
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	8	8	5	8	8	5	8	8	5	8	8
Maximum Green [s]	30	30	30	30	30	30	30	30	30	30	30	30
Amber [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Split [s]	13	34	34	18	39	39	22	47	47	21	46	46
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Walk [s]	0	7	7	0	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	0	23	23	0	24	24	0	36	36	0	35	35
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Recall	No	No	No	No	No	No	No	No	No	No	No	No
Maximum Recall	No	No	No	No	No	No	No	No	No	No	No	No
Pedestrian Recall	No	No	No	No	No	No	No	No	No	No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	R	L	C	R
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00
g_i, Effective Green Time [s]	5	72	85	14	81	93	8	9	18	9	10	28
g / C, Green / Cycle	0.04	0.60	0.71	0.12	0.67	0.77	0.07	0.07	0.15	0.08	0.08	0.23
(v / s)_i Volume / Saturation Flow Rate	0.03	0.19	0.14	0.09	0.16	0.08	0.05	0.05	0.03	0.06	0.04	0.14
s, saturation flow rate [veh/h]	2912	4826	1506	2912	4826	1506	1593	3373	1506	1593	3373	1506
c, Capacity [veh/h]	132	2899	1072	341	3246	1162	104	241	226	124	281	352
d1, Uniform Delay [s]	56.39	11.80	5.78	51.35	7.67	3.41	55.23	54.57	44.90	54.36	52.34	41.11
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	5.36	0.28	0.40	3.44	0.18	0.18	11.60	4.00	0.50	9.99	1.07	1.72
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.65	0.31	0.19	0.76	0.24	0.10	0.78	0.72	0.23	0.78	0.44	0.61
d, Delay for Lane Group [s/veh]	61.75	12.08	6.18	54.78	7.85	3.58	66.83	58.56	45.40	64.36	53.41	42.83
Lane Group LOS	E	B	A	D	A	A	E	E	D	E	D	D
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.38	3.97	1.72	3.92	2.53	0.67	2.75	2.69	1.38	3.19	1.81	5.86
50th-Percentile Queue Length [ft/ln]	34.53	99.35	43.04	98.05	63.34	16.66	68.75	67.37	34.41	79.79	45.23	146.4
95th-Percentile Queue Length [veh/ln]	2.49	7.15	3.10	7.06	4.56	1.20	4.95	4.85	2.48	5.74	3.26	9.83
95th-Percentile Queue Length [ft/ln]	62.16	178.8	77.47	176.5	114.0	29.99	123.7	121.2	61.94	143.6	81.41	245.6

Movement, Approach, & Intersection Results

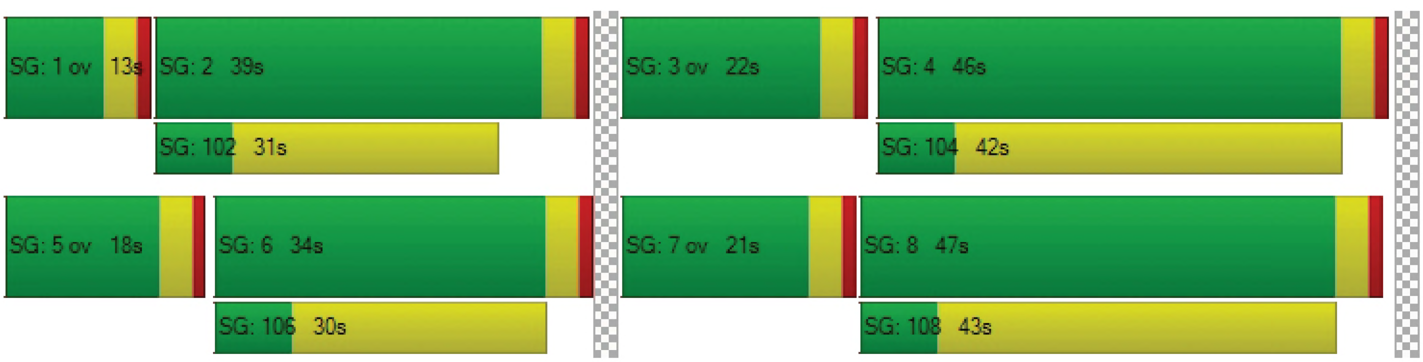
d_M, Delay for Movement [s/veh]	61.75	12.08	6.18	54.78	7.85	3.58	66.83	58.56	45.40	64.36	53.41	42.83
Movement LOS	E	B	A	D	A	A	E	E	D	E	D	D
d_A, Approach Delay [s/veh]	14.62			17.88			58.56			50.59		
Approach LOS	B			B			E			D		
d_I, Intersection Delay [s/veh]	25.19											
Intersection LOS	C											
Intersection V/C	0.514											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.52	49.52	49.52	49.52
I_p,int, Pedestrian LOS Score for Intersection	3.094	3.119	2.570	2.641
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	500	583	716	700
d_b, Bicycle Delay [s]	33.76	30.12	24.72	25.36
I_b,int, Bicycle LOS Score for Intersection	2.222	2.196	1.811	1.918
Bicycle LOS	B	B	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report

Intersection 3: Tippecanoe Avenue at Orange Show Rd/San Bernardino Ave

Control Type:	Signalized	Delay (sec / veh):	27.7
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.653

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Orange Show Rd			San Bernardino Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration	┐║├			┐┐║├			┐║├			┐║├		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Orange Show Rd			San Bernardino Ave		
Base Volume Input [veh/h]	91	797	95	135	682	61	165	236	118	92	163	136
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	91	797	95	135	682	61	165	236	118	92	163	136
Peak Hour Factor	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	26	226	27	38	194	17	47	67	33	26	46	39
Total Analysis Volume [veh/h]	103	905	108	153	774	69	187	268	134	104	185	154
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Permi	Protec	Permi	Permi	ProtP	Permi	Permi	ProtP	Permi	Permi
Signal Group	1	6	0	5	2	0	3	8	0	7	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	8	0	5	8	0	5	8	0	5	8	0
Maximum Green [s]	30	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	18	42	0	11	35	0	12	35	0	12	35	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	22	0	0	24	0	0	24	0	0	24	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	No		No	No		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	L	C	C
C, Cycle Length [s]	100	100	100	100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00
g_i, Effective Green Time [s]	8	55	55	7	54	54	26	15	15	26	14	14
g / C, Green / Cycle	0.08	0.55	0.55	0.07	0.54	0.54	0.26	0.15	0.15	0.26	0.14	0.14
(v / s)_i Volume / Saturation Flow Rate	0.06	0.29	0.29	0.05	0.24	0.24	0.15	0.12	0.12	0.09	0.10	0.11
s, saturation flow rate [veh/h]	1593	1772	1706	2912	1772	1721	1255	1772	1576	1191	1772	1514
c, Capacity [veh/h]	128	973	937	206	956	929	327	268	239	301	247	211
d1, Uniform Delay [s]	45.25	14.34	14.35	45.63	13.99	13.99	31.67	40.94	41.03	30.07	41.26	41.47
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	10.91	2.07	2.15	5.19	1.51	1.56	1.58	5.09	6.13	0.68	4.04	5.51
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.80	0.53	0.53	0.74	0.45	0.45	0.57	0.79	0.80	0.35	0.73	0.76
d, Delay for Lane Group [s/veh]	56.16	16.41	16.50	50.82	15.51	15.55	33.25	46.02	47.16	30.76	45.30	46.98
Lane Group LOS	E	B	B	D	B	B	C	D	D	C	D	D
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	2.89	7.55	7.30	2.00	5.97	5.81	3.89	5.34	4.91	2.03	4.47	4.09
50th-Percentile Queue Length [ft/ln]	72.19	188.8	182.5	50.06	149.3	145.3	97.37	133.5	122.7	50.68	111.7	102.1
95th-Percentile Queue Length [veh/ln]	5.20	12.06	11.74	3.60	9.98	9.77	7.01	9.13	8.54	3.65	7.94	7.36
95th-Percentile Queue Length [ft/ln]	129.9	301.5	293.3	90.10	249.5	244.2	175.2	228.2	213.5	91.22	198.4	183.9

Movement, Approach, & Intersection Results

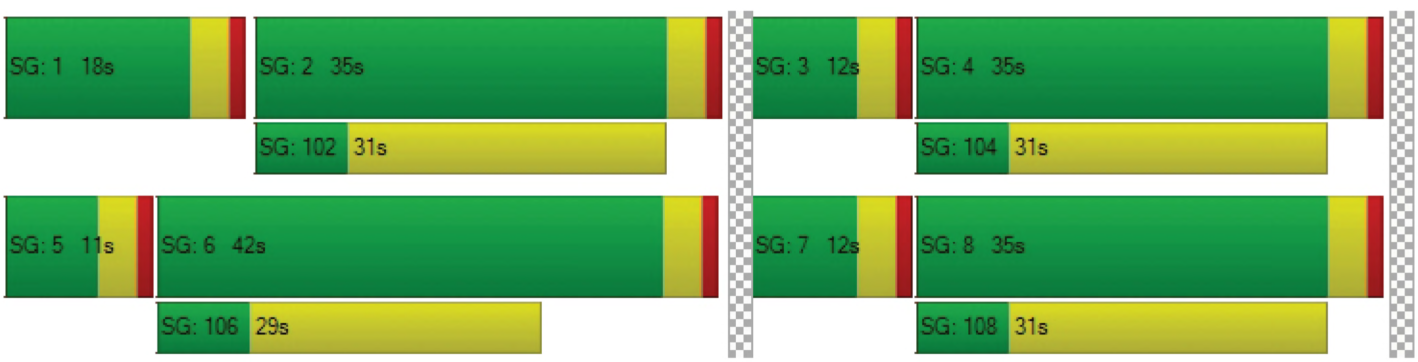
d_M, Delay for Movement [s/veh]	56.16	16.45	16.50	50.82	15.53	15.55	33.25	46.27	47.16	30.76	45.35	46.98
Movement LOS	E	B	B	D	B	B	C	D	D	C	D	D
d_A, Approach Delay [s/veh]		20.12			20.95			42.34			42.49	
Approach LOS		C			C			D			D	
d_I, Intersection Delay [s/veh]	27.70											
Intersection LOS	C											
Intersection V/C	0.653											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	39.64	39.64	39.64	39.64
I_p,int, Pedestrian LOS Score for Intersection	2.745	2.864	2.489	2.494
Crosswalk LOS	B	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	759	620	620	620
d_b, Bicycle Delay [s]	19.25	23.84	23.84	23.84
I_b,int, Bicycle LOS Score for Intersection	2.480	2.381	2.046	1.925
Bicycle LOS	B	B	B	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Tippecanoe Avenue at Harriman Place/I-10 WB Ramps

Control Type:	Signalized	Delay (sec / veh):	28.0
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.535

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Harriman Pl			I-10 WB Ramps		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Harriman Pl			I-10 WB Ramps		
Base Volume Input [veh/h]	174	720	382	0	741	64	47	0	211	555	162	346
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	174	720	382	0	741	64	47	0	211	555	162	346
Peak Hour Factor	0.962	0.962	0.962	1.000	0.962	0.962	0.962	1.000	0.962	0.962	0.962	0.962
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	45	187	99	0	193	17	12	0	55	144	42	90
Total Analysis Volume [veh/h]	181	748	397	0	770	67	49	0	219	577	168	360
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	110
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Protec	Permi	Unsig	Permi	Permi	Permi	Split	Permi	Overla	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	0	3	7	4	0
Auxiliary Signal Groups									1,3			
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	8	8	0	0	8	0	8	0	8	6	8	0
Maximum Green [s]	30	30	0	0	30	0	30	0	30	30	30	0
Amber [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0
Split [s]	12	47	0	0	35	0	12	0	12	10	51	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	21	0	0	24	0	0	0	0	0	39	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0
Minimum Recall	No	No			No		No		No		No	
Maximum Recall	No	No			No		No		No		No	
Pedestrian Recall	No	No			No		No		No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	C	L	R	L	C	R
C, Cycle Length [s]	110	110	110	110	110	110	110	110	110
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	8	64	52	52	8	50	26	26	26
g / C, Green / Cycle	0.07	0.58	0.47	0.47	0.07	0.46	0.24	0.24	0.24
(v / s)_i Volume / Saturation Flow Rate	0.06	0.16	0.13	0.12	0.03	0.08	0.21	0.16	0.18
s, saturation flow rate [veh/h]	2912	4826	4826	1677	1593	2665	2752	1665	1506
c, Capacity [veh/h]	214	2789	2259	785	117	1224	670	399	361
d1, Uniform Delay [s]	50.39	11.61	17.90	17.79	48.76	17.54	40.37	37.82	38.59
k, delay calibration	0.11	0.50	0.50	0.50	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	8.87	0.24	0.31	0.83	2.37	0.07	3.42	1.88	2.87
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.85	0.27	0.28	0.27	0.42	0.18	0.86	0.66	0.73
d, Delay for Lane Group [s/veh]	59.26	11.84	18.21	18.62	51.14	17.61	43.78	39.71	41.46
Lane Group LOS	E	B	B	B	D	B	D	D	D
Critical Lane Group	Yes	No	Yes	No	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	2.72	3.01	3.28	3.37	1.36	1.64	7.76	6.60	6.81
50th-Percentile Queue Length [ft/ln]	67.99	75.32	81.88	84.32	34.10	41.08	194.0	164.9	170.1
95th-Percentile Queue Length [veh/ln]	4.89	5.42	5.90	6.07	2.45	2.96	12.33	10.81	11.09
95th-Percentile Queue Length [ft/ln]	122.37	135.58	147.38	151.78	61.37	73.94	308.2	270.2	277.1

Movement, Approach, & Intersection Results

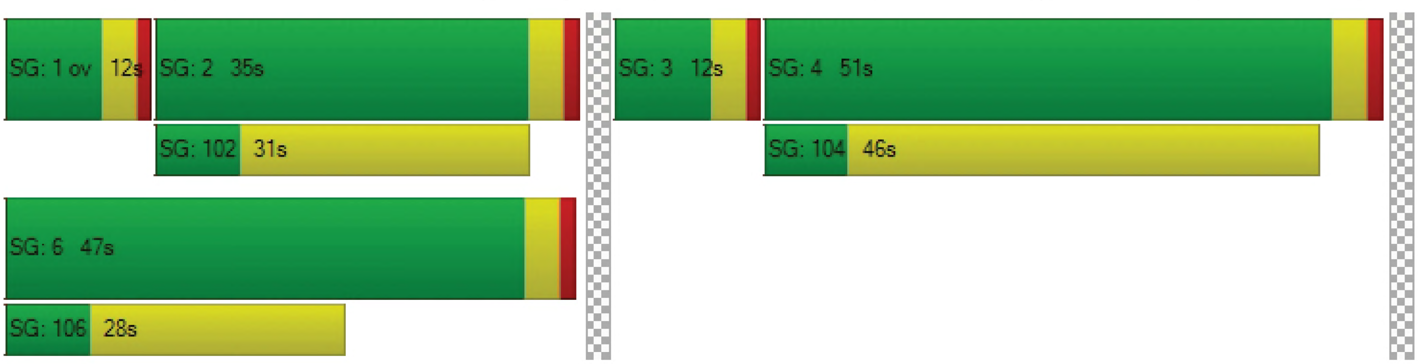
d_M, Delay for Movement [s/veh]	59.26	11.84	0.00	0.00	18.28	18.62	51.14	0.00	17.61	43.78	39.71	40.99
Movement LOS	E	B			B	B	D		B	D	D	D
d_A, Approach Delay [s/veh]	21.08			18.31			23.74			42.25		
Approach LOS	C			B			C			D		
d_I, Intersection Delay [s/veh]	28.02											
Intersection LOS	C											
Intersection V/C	0.535											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	44.58	44.58	44.58
I_p,int, Pedestrian LOS Score for Intersection	0.000	2.881	2.443	2.525
Crosswalk LOS	F	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	781	563	145	854
d_b, Bicycle Delay [s]	20.43	28.39	47.32	18.06
I_b,int, Bicycle LOS Score for Intersection	2.071	1.905	1.560	3.383
Bicycle LOS	B	A	A	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report

Intersection 5: Tippecanoe Avenue/Anderson Street at I-10 EB Ramps

Control Type:	Signalized	Delay (sec / veh):	22.4
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.644

Intersection Setup

Name	Tippecanoe Ave			Anderson St			I-10 EB Ramps			I-10 EB Ramps		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No					
Crosswalk	No			No			No			Yes		

Volumes

Name	Tippecanoe Ave			Anderson St			I-10 EB Ramps			I-10 EB Ramps		
Base Volume Input [veh/h]	0	659	304	195	834	0	617	3	673	0	0	0
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	659	304	195	834	0	617	3	673	0	0	0
Peak Hour Factor	1.000	0.935	0.935	0.935	0.935	1.000	0.935	0.935	0.935	1.000	1.000	1.000
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	0	176	81	52	223	0	165	1	180	0	0	0
Total Analysis Volume [veh/h]	0	705	325	209	892	0	660	3	720	0	0	0
Presence of On-Street Parking	No		No	No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]		0			0			0			0	
v_di, Inbound Pedestrian Volume crossing major street [ped/h]		0			0			0			0	
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]		0			0			0			0	
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]		0			0			0			0	
v_ab, Corner Pedestrian Volume [ped/h]		0			0			0			0	
Bicycle Volume [bicycles/h]		0			0			0			0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permi	Permi	Permi	Protec	Permi	Permi	Split	Split	Split	Permi	Permi	Permi
Signal Group	0	6	0	5	2	0	0	8	0	0	0	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	0	8	0	8	8	0	0	8	0	0	0	0
Maximum Green [s]	0	30	0	30	30	0	0	30	0	0	0	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
Split [s]	0	25	0	12	37	0	0	53	0	0	0	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Walk [s]	0	7	0	0	0	0	0	0	0	0	0	0
Pedestrian Clearance [s]	0	14	0	0	0	0	0	0	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No				
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Minimum Recall		No		No	No			No				
Maximum Recall		No		No	No			No				
Pedestrian Recall		No		No	No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	R	L	C	L	C	R	
C, Cycle Length [s]	90	90	90	90	90	90	90	
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]	41	41	8	53	29	29	29	
g / C, Green / Cycle	0.46	0.46	0.09	0.59	0.32	0.32	0.32	
(v / s)_i Volume / Saturation Flow Rate	0.21	0.22	0.07	0.26	0.21	0.21	0.27	
s, saturation flow rate [veh/h]	3373	1506	2912	3373	1593	1594	2665	
c, Capacity [veh/h]	1535	685	262	1988	513	513	858	
d1, Uniform Delay [s]	16.89	17.04	40.18	10.32	26.15	26.15	28.38	
k, delay calibration	0.50	0.50	0.11	0.50	0.11	0.11	0.11	
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]	0.99	2.34	5.57	0.73	1.38	1.37	2.30	
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity	0.46	0.47	0.80	0.45	0.65	0.65	0.84	
d, Delay for Lane Group [s/veh]	17.89	19.39	45.76	11.05	27.53	27.52	30.68	
Lane Group LOS	B	B	D	B	C	C	C	
Critical Lane Group	No	Yes	Yes	No	No	No	Yes	
50th-Percentile Queue Length [veh/ln]	4.99	4.89	2.44	4.68	6.09	6.09	7.22	
50th-Percentile Queue Length [ft/ln]	124.78	122.29	61.04	116.94	152.2	152.2	180.4	
95th-Percentile Queue Length [veh/ln]	8.65	8.52	4.39	8.22	10.14	10.14	11.63	
95th-Percentile Queue Length [ft/ln]	216.37	212.97	109.86	205.62	253.4	253.3	290.6	

Movement, Approach, & Intersection Results

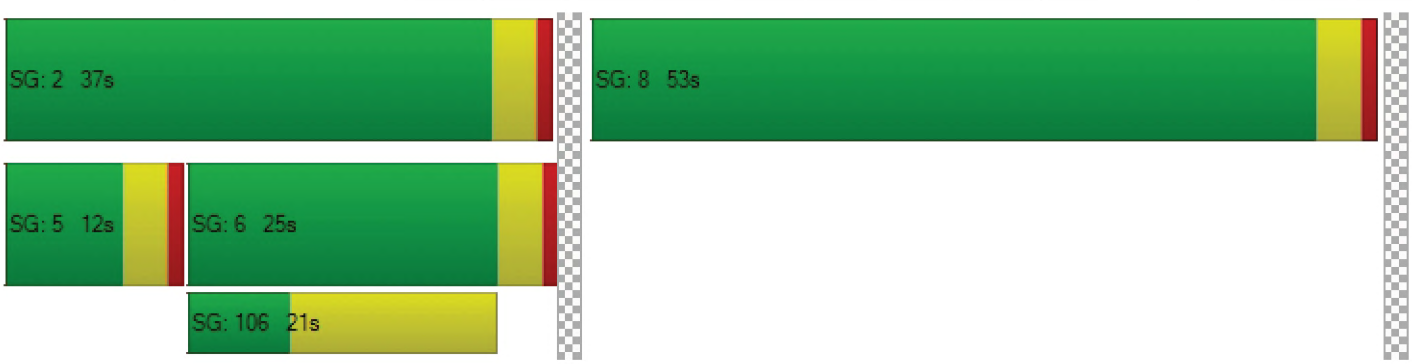
d_M, Delay for Movement [s/veh]	0.00	17.89	19.39	45.76	11.05	0.00	27.53	27.52	30.68	0.00	0.00	0.00
Movement LOS		B	B	D	B		C	C	C			
d_A, Approach Delay [s/veh]	18.36			17.64			29.17			0.00		
Approach LOS	B			B			C			A		
d_I, Intersection Delay [s/veh]	22.39											
Intersection LOS	C											
Intersection V/C	0.644											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	34.68
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	1.976
Crosswalk LOS	F	F	F	A
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	467	733	1089	0
d_b, Bicycle Delay [s]	26.46	18.06	9.35	45.01
I_b,int, Bicycle LOS Score for Intersection	2.409	2.468	3.842	4.132
Bicycle LOS	B	B	D	D

Sequence

Ring 1	-	2	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 1: Tippecanoe Avenue at Mill Street

Control Type:	Signalized	Delay (sec / veh):	17.8
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.489

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Mill Street			Mill Street		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			No			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Mill Street			Mill Street		
Base Volume Input [veh/h]	74	1193	0	1	850	201	246	14	239	8	11	4
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	74	1193	0	1	850	201	246	14	239	8	11	4
Peak Hour Factor	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	21	335	0	0	239	57	69	4	67	2	3	1
Total Analysis Volume [veh/h]	83	1342	0	1	956	226	277	16	269	9	12	4
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Permi	Protec	Permi	Overla	Split	Split	Overla	Split	Split	Split
Signal Group	1	6	0	5	2	2	0	8	8	0	4	0
Auxiliary Signal Groups						2,8			1,8			
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	5	8	0	5	8	8	0	8	8	0	8	0
Maximum Green [s]	30	30	0	30	30	30	0	30	30	0	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	0.0
Split [s]	16	52	0	9	45	45	0	47	47	0	12	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	7	0	7	7	0	0	0
Pedestrian Clearance [s]	0	41	0	0	24	24	0	36	36	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	0.0
Minimum Recall	No	No		No	No	No		No	No		No	
Maximum Recall	No	No		No	No	No		No	No		No	
Pedestrian Recall	No	No		No	No	No		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	R	L	C	R	L	C	R
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	12	84	84	0	73	100	15	15	31	5	5	5
g / C, Green / Cycle	0.10	0.70	0.70	0.00	0.61	0.83	0.12	0.12	0.26	0.04	0.04	0.04
(v / s)_i Volume / Saturation Flow Rate	0.05	0.26	0.26	0.00	0.20	0.15	0.09	0.09	0.18	0.01	0.00	0.00
s, saturation flow rate [veh/h]	1593	3373	1772	1593	4826	1506	1593	1602	1506	1593	3373	1506
c, Capacity [veh/h]	160	2373	1246	3	2920	1254	196	197	387	61	129	57
d1, Uniform Delay [s]	51.25	7.14	7.14	59.83	11.68	1.97	50.79	50.79	40.35	55.84	55.72	55.67
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.24	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.60	0.45	0.85	56.60	0.30	0.32	5.49	5.46	4.95	1.11	0.31	0.51
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.52	0.37	0.37	0.34	0.33	0.18	0.74	0.74	0.70	0.15	0.09	0.07
d, Delay for Lane Group [s/veh]	53.85	7.59	7.99	116.4	11.98	2.28	56.28	56.24	45.30	56.95	56.03	56.18
Lane Group LOS	D	A	A	F	B	A	E	E	D	E	E	E
Critical Lane Group	No	Yes	No	Yes	No	No	No	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	2.49	4.30	4.66	0.08	4.16	0.82	4.54	4.56	7.70	0.28	0.18	0.13
50th-Percentile Queue Length [ft/ln]	62.24	107.6	116.5	1.92	104.0	20.54	113.4	113.9	192.5	7.07	4.53	3.13
95th-Percentile Queue Length [veh/ln]	4.48	7.71	8.20	0.14	7.49	1.48	8.03	8.06	12.26	0.51	0.33	0.23
95th-Percentile Queue Length [ft/ln]	112.0	192.6	205.0	3.46	187.2	36.96	200.8	201.5	306.3	12.73	8.16	5.63

Movement, Approach, & Intersection Results

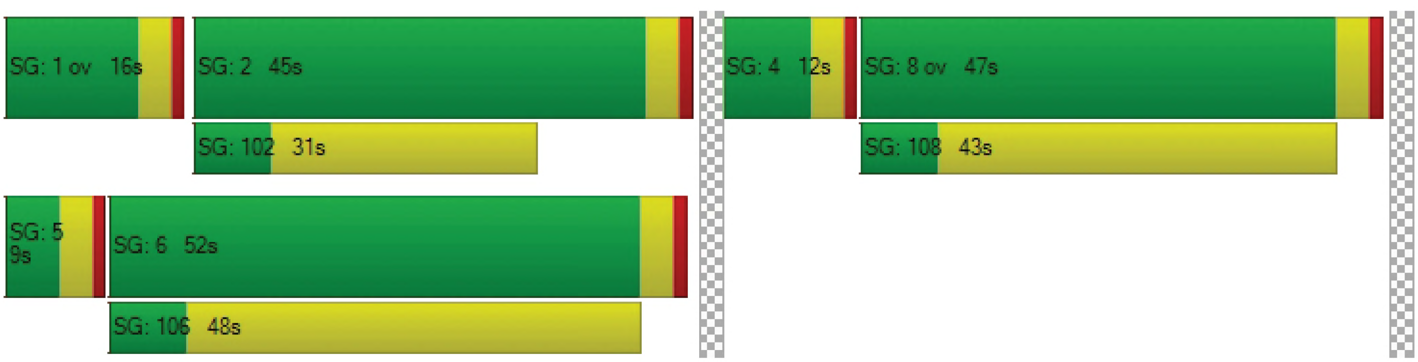
d_M, Delay for Movement [s/veh]	53.85	7.73	7.99	116.4	11.98	2.28	56.26	56.24	45.30	56.95	56.03	56.18
Movement LOS	D	A	A	F	B	A	E	E	D	E	E	E
d_A, Approach Delay [s/veh]	10.41			10.21			51.01			56.39		
Approach LOS	B			B			D			E		
d_I, Intersection Delay [s/veh]	17.84											
Intersection LOS	B											
Intersection V/C	0.489											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.51	0.00	49.51	49.51
I_p,int, Pedestrian LOS Score for Intersection	2.978	0.000	2.486	2.322
Crosswalk LOS	C	F	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	800	683	717	133
d_b, Bicycle Delay [s]	21.61	26.01	24.71	52.27
I_b,int, Bicycle LOS Score for Intersection	2.343	2.210	2.487	1.580
Bicycle LOS	B	B	B	A

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Tippecanoe Avenue at Central Avenue

Control Type:	Signalized	Delay (sec / veh):	25.5
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.526

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Central Avenue			Central Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Central Avenue			Central Avenue		
Base Volume Input [veh/h]	75	881	84	199	804	115	129	109	51	118	157	199
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	75	881	84	199	804	115	129	109	51	118	157	199
Peak Hour Factor	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	19	229	22	52	209	30	34	28	13	31	41	52
Total Analysis Volume [veh/h]	78	916	87	207	836	120	134	113	53	123	163	207
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	115
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Overla	Protec	Permi	Overla	Protec	Permi	Overla	Protec	Permi	Overla
Signal Group	1	6	6	5	2	2	3	8	8	7	4	4
Auxiliary Signal Groups			6,7			2,3			1,8			4,5
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	8	8	5	8	8	5	8	8	5	8	8
Maximum Green [s]	30	30	30	30	30	30	30	30	30	30	30	30
Amber [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Split [s]	9	34	34	16	41	41	19	47	47	18	46	46
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Walk [s]	0	7	7	0	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	0	23	23	0	24	24	0	36	36	0	35	35
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Recall	No	No	No	No	No	No	No	No	No	No	No	No
Maximum Recall	No	No	No	No	No	No	No	No	No	No	No	No
Pedestrian Recall	No	No	No	No	No	No	No	No	No	No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	R	L	C	R
C, Cycle Length [s]	115	115	115	115	115	115	115	115	115	115	115	115
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00
g_i, Effective Green Time [s]	5	67	82	12	74	90	12	9	18	11	8	24
g / C, Green / Cycle	0.04	0.58	0.71	0.10	0.64	0.78	0.10	0.08	0.16	0.09	0.07	0.21
(v / s)_i Volume / Saturation Flow Rate	0.03	0.19	0.06	0.07	0.17	0.08	0.08	0.03	0.04	0.08	0.05	0.14
s, saturation flow rate [veh/h]	2912	4826	1506	2912	4826	1506	1593	3373	1506	1593	3373	1506
c, Capacity [veh/h]	129	2809	1070	305	3102	1172	161	272	240	149	246	320
d1, Uniform Delay [s]	54.01	12.40	5.13	49.63	8.88	3.07	50.77	50.33	42.12	51.25	51.96	41.37
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	4.51	0.31	0.15	2.63	0.21	0.18	10.51	1.01	0.46	10.92	3.04	2.19
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.61	0.33	0.08	0.68	0.27	0.10	0.83	0.42	0.22	0.83	0.66	0.65
d, Delay for Lane Group [s/veh]	58.52	12.71	5.28	52.27	9.10	3.24	61.28	51.34	42.58	62.17	55.01	43.56
Lane Group LOS	E	B	A	D	A	A	E	D	D	E	E	D
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.19	4.02	0.63	2.98	2.93	0.60	4.25	1.59	1.35	3.93	2.39	5.55
50th-Percentile Queue Length [ft/ln]	29.74	100.4	15.78	74.46	73.17	15.02	106.3	39.70	33.71	98.25	59.87	138.6
95th-Percentile Queue Length [veh/ln]	2.14	7.23	1.14	5.36	5.27	1.08	7.63	2.86	2.43	7.07	4.31	9.41
95th-Percentile Queue Length [ft/ln]	53.53	180.7	28.41	134.0	131.7	27.04	190.8	71.45	60.69	176.8	107.7	235.2

Movement, Approach, & Intersection Results

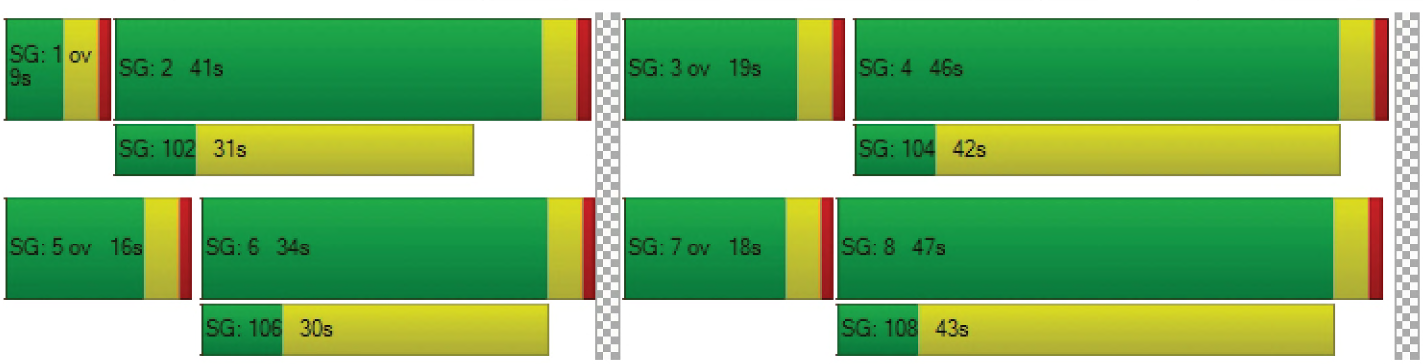
d_M, Delay for Movement [s/veh]	58.52	12.71	5.28	52.27	9.10	3.24	61.28	51.34	42.58	62.17	55.01	43.56
Movement LOS	E	B	A	D	A	A	E	D	D	E	E	D
d_A, Approach Delay [s/veh]	15.42			16.18			54.23			51.99		
Approach LOS	B			B			D			D		
d_I, Intersection Delay [s/veh]	25.48											
Intersection LOS	C											
Intersection V/C	0.526											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	47.05	47.05	47.05	47.05
I_p,int, Pedestrian LOS Score for Intersection	3.088	3.123	2.572	2.611
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	522	643	748	730
d_b, Bicycle Delay [s]	31.43	26.47	22.56	23.19
I_b,int, Bicycle LOS Score for Intersection	2.154	2.199	1.807	1.966
Bicycle LOS	B	B	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Tippecanoe Avenue at Orange Show Rd/San Bernardino Ave

Control Type:	Signalized	Delay (sec / veh):	29.9
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.750

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Orange Show Rd			San Bernardino Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Orange Show Rd			San Bernardino Ave		
Base Volume Input [veh/h]	97	846	104	222	800	66	170	390	125	69	306	184
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	97	846	104	222	800	66	170	390	125	69	306	184
Peak Hour Factor	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	26	228	28	60	216	18	46	105	34	19	82	50
Total Analysis Volume [veh/h]	105	912	112	239	862	71	183	420	135	74	330	198
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]		0			0			0			0	
v_di, Inbound Pedestrian Volume crossing major street [ped/h]		0			0			0			0	
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]		0			0			0			0	
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]		0			0			0			0	
v_ab, Corner Pedestrian Volume [ped/h]		0			0			0			0	
Bicycle Volume [bicycles/h]		0			0			0			0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	95
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Permi	Protec	Permi	Permi	ProtP	Permi	Permi	ProtP	Permi	Permi
Signal Group	1	6	0	5	2	0	3	8	0	7	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	8	0	5	8	0	5	8	0	5	8	0
Maximum Green [s]	30	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	12	33	0	14	35	0	10	39	0	9	38	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	22	0	0	24	0	0	24	0	0	24	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	No		No	No		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	L	C	C
C, Cycle Length [s]	95	95	95	95	95	95	95	95	95	95	95	95
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00
g_i, Effective Green Time [s]	8	42	42	10	44	44	31	23	23	31	21	21
g / C, Green / Cycle	0.08	0.44	0.44	0.10	0.46	0.46	0.33	0.24	0.24	0.33	0.23	0.23
(v / s)_i Volume / Saturation Flow Rate	0.07	0.29	0.29	0.08	0.27	0.27	0.17	0.16	0.16	0.07	0.16	0.16
s, saturation flow rate [veh/h]	1593	1772	1705	2912	1772	1725	1059	1772	1626	1007	1772	1554
c, Capacity [veh/h]	129	782	753	297	819	798	320	427	392	305	398	349
d1, Uniform Delay [s]	42.97	21.01	21.02	41.76	18.74	18.74	25.94	32.74	32.77	23.70	33.93	34.04
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.12	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	11.45	4.47	4.66	5.09	2.95	3.04	1.76	1.88	2.08	0.41	2.26	2.72
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.81	0.67	0.67	0.80	0.58	0.58	0.57	0.68	0.68	0.24	0.70	0.71
d, Delay for Lane Group [s/veh]	54.41	25.49	25.68	46.85	21.68	21.78	27.69	34.62	34.85	24.10	36.19	36.77
Lane Group LOS	D	C	C	D	C	C	C	C	C	C	D	D
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	2.81	9.75	9.43	2.92	7.96	7.78	3.21	6.13	5.68	1.18	6.07	5.48
50th-Percentile Queue Length [ft/ln]	70.36	243.6	235.6	73.04	199.0	194.5	80.32	153.2	142.0	29.55	151.6	136.8
95th-Percentile Queue Length [veh/ln]	5.07	14.87	14.46	5.26	12.59	12.36	5.78	10.19	9.59	2.13	10.10	9.31
95th-Percentile Queue Length [ft/ln]	126.6	371.6	361.5	131.4	314.7	308.9	144.5	254.8	239.7	53.18	252.6	232.8

Movement, Approach, & Intersection Results

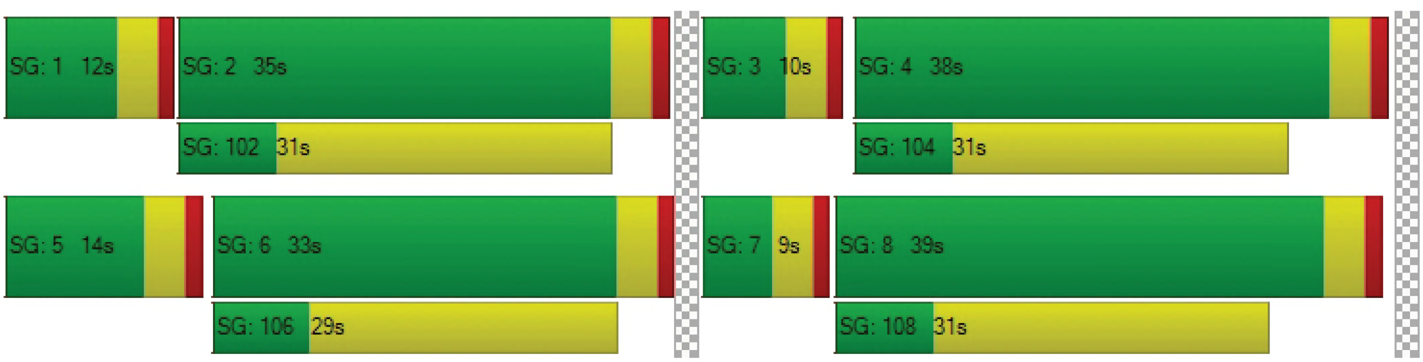
d_M, Delay for Movement [s/veh]	54.41	25.57	25.68	46.85	21.73	21.78	27.69	34.69	34.85	24.10	36.28	36.77
Movement LOS	D	C	C	D	C	C	C	C	C	C	D	D
d_A, Approach Delay [s/veh]	28.26			26.85			32.98			34.94		
Approach LOS	C			C			C			C		
d_I, Intersection Delay [s/veh]	29.87											
Intersection LOS	C											
Intersection V/C	0.750											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	37.16	37.16	37.16	37.16
I_p,int, Pedestrian LOS Score for Intersection	2.759	2.920	2.545	2.570
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	610	652	737	715
d_b, Bicycle Delay [s]	22.94	21.58	18.96	19.60
I_b,int, Bicycle LOS Score for Intersection	2.491	2.527	2.168	2.056
Bicycle LOS	B	B	B	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Tippecanoe Avenue at Harriman Place/I-10 WB Ramps

Control Type:	Signalized	Delay (sec / veh):	34.4
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.839

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Harriman Pl			I-10 WB Ramps		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Harriman Pl			I-10 WB Ramps		
Base Volume Input [veh/h]	328	657	595	0	1138	182	157	0	631	226	253	346
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	328	657	595	0	1138	182	157	0	631	226	253	346
Peak Hour Factor	0.949	0.949	0.949	1.000	0.949	0.949	0.949	1.000	0.949	0.949	0.949	0.949
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	86	173	157	0	300	48	41	0	166	60	67	91
Total Analysis Volume [veh/h]	346	692	627	0	1199	192	165	0	665	238	267	365
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]		0			0			0			0	
v_di, Inbound Pedestrian Volume crossing major street [ped/h]		0			0			0			0	
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]		0			0			0			0	
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]		0			0			0			0	
v_ab, Corner Pedestrian Volume [ped/h]		0			0			0			0	
Bicycle Volume [bicycles/h]		0			0			0			0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Protec	Permi	Unsig	Permi	Permi	Permi	Split	Permi	Overla	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	0	3	7	4	0
Auxiliary Signal Groups									1,3			
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	8	8	0	0	8	0	8	0	8	6	8	0
Maximum Green [s]	30	30	0	0	30	0	30	0	30	30	30	0
Amber [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0
Split [s]	18	53	0	0	35	0	17	0	17	10	50	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	21	0	0	24	0	0	0	0	0	39	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0
Minimum Recall	No	No			No		No		No		No	
Maximum Recall	No	No			No		No		No		No	
Pedestrian Recall	No	No			No		No		No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	C	L	R	L	C	R
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	14	67	49	49	13	63	28	28	28
g / C, Green / Cycle	0.12	0.56	0.41	0.41	0.11	0.52	0.23	0.23	0.23
(v / s)_i Volume / Saturation Flow Rate	0.12	0.14	0.22	0.22	0.10	0.25	0.09	0.19	0.20
s, saturation flow rate [veh/h]	2912	4826	4826	1614	1593	2665	2752	1718	1506
c, Capacity [veh/h]	341	2708	1982	663	173	1393	647	395	347
d1, Uniform Delay [s]	53.00	13.50	26.60	26.57	53.18	18.22	39.02	43.86	44.72
k, delay calibration	0.11	0.50	0.50	0.50	0.11	0.11	0.11	0.11	0.12
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	26.25	0.23	1.00	2.95	21.93	0.25	0.35	4.27	8.32
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.01	0.26	0.53	0.52	0.95	0.48	0.37	0.82	0.89
d, Delay for Lane Group [s/veh]	79.25	13.73	27.60	29.53	75.12	18.48	39.37	48.14	53.03
Lane Group LOS	F	B	C	C	E	B	D	D	D
Critical Lane Group	Yes	No	Yes	No	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	6.37	3.22	7.61	7.97	6.00	5.83	3.00	9.58	9.61
50th-Percentile Queue Length [ft/ln]	159.37	80.44	190.35	199.16	149.91	145.77	75.09	239.5	240.2
95th-Percentile Queue Length [veh/ln]	10.58	5.79	12.14	12.60	10.01	9.79	5.41	14.66	14.70
95th-Percentile Queue Length [ft/ln]	264.38	144.80	303.48	314.88	250.31	244.78	135.1	366.4	367.4

Movement, Approach, & Intersection Results

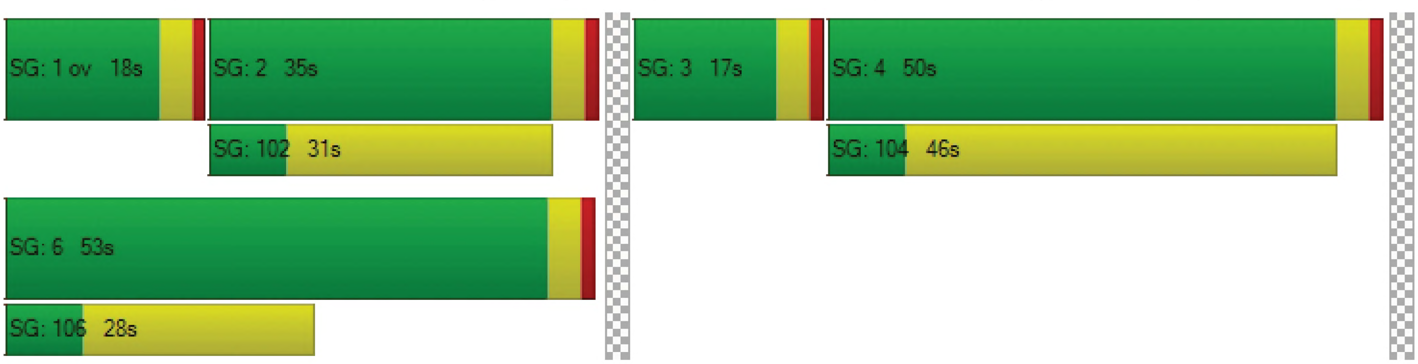
d_M, Delay for Movement [s/veh]	79.25	13.73	0.00	0.00	27.85	29.53	75.12	0.00	18.48	39.37	48.14	52.35
Movement LOS	F	B			C	C	E		B	D	D	D
d_A, Approach Delay [s/veh]	35.57			28.09			29.74			47.47		
Approach LOS	D			C			C			D		
d_I, Intersection Delay [s/veh]	34.38											
Intersection LOS	C											
Intersection V/C	0.839											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	49.52	49.52	49.52
I_p,int, Pedestrian LOS Score for Intersection	0.000	2.972	2.632	2.483
Crosswalk LOS	F	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	816	517	217	766
d_b, Bicycle Delay [s]	21.02	33.02	47.72	22.83
I_b,int, Bicycle LOS Score for Intersection	2.131	2.133	1.560	2.995
Bicycle LOS	B	B	A	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Tippecanoe Avenue/Anderson Street at I-10 EB Ramps

Control Type:	Signalized	Delay (sec / veh):	26.4
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.799

Intersection Setup

Name	Tippecanoe Ave			Anderson St			I-10 EB Ramps			I-10 EB Ramps		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No					
Crosswalk	No			No			No			Yes		

Volumes

Name	Tippecanoe Ave			Anderson St			I-10 EB Ramps			I-10 EB Ramps		
Base Volume Input [veh/h]	0	1177	356	628	814	0	386	3	306	0	0	0
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	1177	356	628	814	0	386	3	306	0	0	0
Peak Hour Factor	1.000	0.976	0.976	0.976	0.976	1.000	0.976	0.976	0.976	1.000	1.000	1.000
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	0	301	91	161	209	0	99	1	78	0	0	0
Total Analysis Volume [veh/h]	0	1206	365	643	834	0	395	3	314	0	0	0
Presence of On-Street Parking	No		No	No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]		0			0			0			0	
v_di, Inbound Pedestrian Volume crossing major street [ped/h]		0			0			0			0	
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]		0			0			0			0	
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]		0			0			0			0	
v_ab, Corner Pedestrian Volume [ped/h]		0			0			0			0	
Bicycle Volume [bicycles/h]		0			0			0			0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permi	Permi	Permi	Protec	Permi	Permi	Split	Split	Split	Permi	Permi	Permi
Signal Group	0	6	0	5	2	0	0	8	0	0	0	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	0	8	0	8	8	0	0	8	0	0	0	0
Maximum Green [s]	0	30	0	30	30	0	0	30	0	0	0	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
Split [s]	0	25	0	56	81	0	0	19	0	0	0	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Walk [s]	0	7	0	0	0	0	0	0	0	0	0	0
Pedestrian Clearance [s]	0	14	0	0	0	0	0	0	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No				
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Minimum Recall		No		No	No			No				
Maximum Recall		No		No	No			No				
Pedestrian Recall		No		No	No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	R	L	C	L	C	R	
C, Cycle Length [s]	100	100	100	100	100	100	100	
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]	48	48	25	78	14	14	14	
g / C, Green / Cycle	0.48	0.48	0.25	0.78	0.14	0.14	0.14	
(v / s)_i Volume / Saturation Flow Rate	0.36	0.24	0.22	0.25	0.12	0.12	0.12	
s, saturation flow rate [veh/h]	3373	1506	2912	3373	1593	1595	2665	
c, Capacity [veh/h]	1630	728	734	2616	230	231	385	
d1, Uniform Delay [s]	20.78	17.62	35.89	3.35	41.81	41.81	41.48	
k, delay calibration	0.50	0.50	0.11	0.50	0.11	0.11	0.11	
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]	3.06	2.46	3.51	0.32	9.29	9.28	4.23	
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity	0.74	0.50	0.88	0.32	0.86	0.86	0.81	
d, Delay for Lane Group [s/veh]	23.84	20.08	39.40	3.67	51.10	51.09	45.71	
Lane Group LOS	C	C	D	A	D	D	D	
Critical Lane Group	Yes	No	Yes	No	Yes	No	No	
50th-Percentile Queue Length [veh/ln]	11.45	6.02	7.74	1.97	5.34	5.34	3.94	
50th-Percentile Queue Length [ft/ln]	286.31	150.52	193.48	49.30	133.5	133.6	98.58	
95th-Percentile Queue Length [veh/ln]	17.00	10.04	12.30	3.55	9.13	9.14	7.10	
95th-Percentile Queue Length [ft/ln]	425.06	251.12	307.54	88.75	228.3	228.3	177.4	

Movement, Approach, & Intersection Results

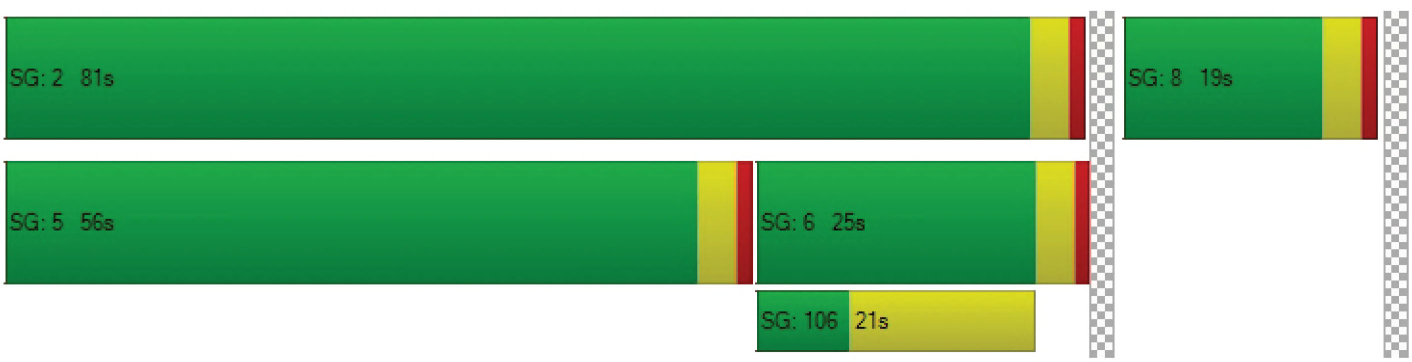
d_M, Delay for Movement [s/veh]	0.00	23.84	20.08	39.40	3.67	0.00	51.10	51.09	45.71	0.00	0.00	0.00
Movement LOS		C	C	D	A		D	D	D			
d_A, Approach Delay [s/veh]	22.96			19.22			48.72			0.00		
Approach LOS	C			B			D			A		
d_I, Intersection Delay [s/veh]	26.37											
Intersection LOS	C											
Intersection V/C	0.799											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	39.61
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	2.213
Crosswalk LOS	F	F	F	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	420	1540	300	0
d_b, Bicycle Delay [s]	31.21	2.65	36.13	50.00
I_b,int, Bicycle LOS Score for Intersection	2.856	2.778	2.734	4.132
Bicycle LOS	C	C	B	D

Sequence

Ring 1	-	2	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



APPENDIX C-II

EXISTING PLUS PROJECT TRAFFIC CONDITIONS

Intersection Level Of Service Report
Intersection 1: Tippecanoe Avenue at Mill Street

Control Type:	Signalized	Delay (sec / veh):	19.9
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.531

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Mill Street			Mill Street		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			No			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Mill Street			Mill Street		
Base Volume Input [veh/h]	182	877	0	14	904	103	157	15	153	23	11	2
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	182	877	0	14	904	103	157	15	153	23	11	2
Peak Hour Factor	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	52	252	0	4	260	30	45	4	44	7	3	1
Total Analysis Volume [veh/h]	209	1009	0	16	1040	119	181	17	176	26	13	2
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Permi	Protec	Permi	Overla	Split	Split	Overla	Split	Split	Split
Signal Group	1	6	0	5	2	2	0	8	8	0	4	0
Auxiliary Signal Groups						2,8			1,8			
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	5	8	0	5	8	8	0	8	8	0	8	0
Maximum Green [s]	30	30	0	30	30	30	0	30	30	0	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	0.0
Split [s]	26	52	0	9	35	35	0	47	47	0	12	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	7	0	7	7	0	0	0
Pedestrian Clearance [s]	0	41	0	0	24	24	0	36	36	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	0.0
Minimum Recall	No	No		No	No	No		No	No		No	
Maximum Recall	No	No		No	No	No		No	No		No	
Pedestrian Recall	No	No		No	No	No		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	R	L	C	R	L	C	R
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	18	85	85	2	70	94	11	11	32	6	6	6
g / C, Green / Cycle	0.15	0.71	0.71	0.02	0.58	0.78	0.09	0.09	0.27	0.05	0.05	0.05
(v / s)_i Volume / Saturation Flow Rate	0.13	0.20	0.20	0.01	0.22	0.08	0.06	0.06	0.12	0.02	0.00	0.00
s, saturation flow rate [veh/h]	1593	3373	1772	1593	4826	1506	1593	1607	1506	1593	3373	1506
c, Capacity [veh/h]	238	2399	1260	28	2798	1181	140	141	407	80	169	75
d1, Uniform Delay [s]	50.02	6.23	6.23	58.50	13.51	3.03	53.24	53.24	36.20	55.05	54.36	54.23
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	10.10	0.29	0.54	16.65	0.38	0.17	6.36	6.30	0.73	2.34	0.19	0.14
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.88	0.28	0.28	0.57	0.37	0.10	0.71	0.71	0.43	0.33	0.08	0.03
d, Delay for Lane Group [s/veh]	60.12	6.51	6.77	75.15	13.89	3.20	59.60	59.54	36.93	57.39	54.55	54.37
Lane Group LOS	E	A	A	E	B	A	E	E	D	E	D	D
Critical Lane Group	Yes	No	No	No	Yes	No	No	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	6.80	2.86	3.10	0.61	5.01	0.61	3.14	3.16	4.36	0.81	0.19	0.06
50th-Percentile Queue Length [ft/ln]	169.9	71.57	77.43	15.33	125.2	15.30	78.53	79.09	108.9	20.32	4.81	1.51
95th-Percentile Queue Length [veh/ln]	11.07	5.15	5.58	1.10	8.68	1.10	5.65	5.69	7.78	1.46	0.35	0.11
95th-Percentile Queue Length [ft/ln]	276.8	128.8	139.3	27.60	216.9	27.55	141.3	142.3	194.5	36.57	8.66	2.73

Movement, Approach, & Intersection Results

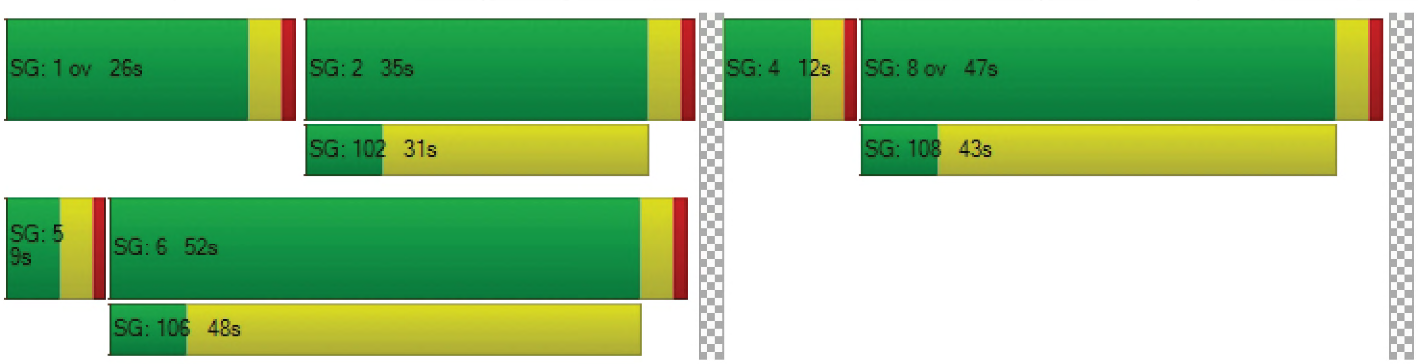
d_M, Delay for Movement [s/veh]	60.12	6.60	6.77	75.15	13.89	3.20	59.57	59.54	36.93	57.39	54.55	54.37
Movement LOS	E	A	A	E	B	A	E	E	D	E	D	D
d_A, Approach Delay [s/veh]	15.79			13.64			48.92			56.34		
Approach LOS	B			B			D			E		
d_I, Intersection Delay [s/veh]	19.89											
Intersection LOS	B											
Intersection V/C	0.531											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.51	0.00	49.51	49.51
I_p,int, Pedestrian LOS Score for Intersection	2.950	0.000	2.453	2.328
Crosswalk LOS	C	F	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	800	517	717	133
d_b, Bicycle Delay [s]	21.61	33.01	24.71	52.27
I_b,int, Bicycle LOS Score for Intersection	2.230	2.206	2.177	1.593
Bicycle LOS	B	B	B	A

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Tippecanoe Avenue at Central Avenue

Control Type:	Signalized	Delay (sec / veh):	26.3
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.517

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Central Avenue			Central Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Central Avenue			Central Avenue		
Base Volume Input [veh/h]	105	835	189	237	740	129	100	163	55	88	116	197
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	105	835	189	237	740	129	100	163	55	88	116	197
Peak Hour Factor	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	29	227	51	65	202	35	27	44	15	24	32	54
Total Analysis Volume [veh/h]	114	910	206	258	806	141	109	178	60	96	126	215
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Overla	Protec	Permi	Overla	Protec	Permi	Overla	Protec	Permi	Overla
Signal Group	1	6	6	5	2	2	3	8	8	7	4	4
Auxiliary Signal Groups			6,7			2,3			1,8			4,5
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	8	8	5	8	8	5	8	8	5	8	8
Maximum Green [s]	30	30	30	30	30	30	30	30	30	30	30	30
Amber [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Split [s]	13	34	34	18	39	39	22	47	47	21	46	46
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Walk [s]	0	7	7	0	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	0	23	23	0	24	24	0	36	36	0	35	35
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Recall	No	No	No	No	No	No	No	No	No	No	No	No
Maximum Recall	No	No	No	No	No	No	No	No	No	No	No	No
Pedestrian Recall	No	No	No	No	No	No	No	No	No	No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	R	L	C	R
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00
g_i, Effective Green Time [s]	7	73	86	13	79	93	10	9	20	9	8	25
g / C, Green / Cycle	0.05	0.61	0.72	0.11	0.66	0.78	0.08	0.08	0.17	0.08	0.07	0.21
(v / s)_i Volume / Saturation Flow Rate	0.04	0.19	0.14	0.09	0.17	0.09	0.07	0.05	0.04	0.06	0.04	0.14
s, saturation flow rate [veh/h]	2912	4826	1506	2912	4826	1506	1593	3373	1506	1593	3373	1506
c, Capacity [veh/h]	160	2923	1078	311	3172	1168	136	260	249	123	234	315
d1, Uniform Delay [s]	55.77	11.50	5.60	52.55	8.46	3.33	53.93	53.95	43.51	54.39	54.00	43.77
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	5.70	0.28	0.39	5.70	0.19	0.21	10.54	3.15	0.49	10.23	1.93	2.60
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.71	0.31	0.19	0.83	0.25	0.12	0.80	0.68	0.24	0.78	0.54	0.68
d, Delay for Lane Group [s/veh]	61.47	11.78	6.00	58.24	8.66	3.54	64.47	57.10	44.01	64.62	55.93	46.37
Lane Group LOS	E	B	A	E	A	A	E	E	D	E	E	D
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.83	3.91	1.69	4.05	2.81	0.78	3.63	2.73	1.59	3.20	1.90	6.12
50th-Percentile Queue Length [ft/ln]	45.63	97.63	42.14	101.3	70.23	19.58	90.71	68.33	39.81	79.96	47.61	152.9
95th-Percentile Queue Length [veh/ln]	3.29	7.03	3.03	7.30	5.06	1.41	6.53	4.92	2.87	5.76	3.43	10.18
95th-Percentile Queue Length [ft/ln]	82.13	175.7	75.85	182.4	126.4	35.24	163.2	122.9	71.65	143.9	85.69	254.3

Movement, Approach, & Intersection Results

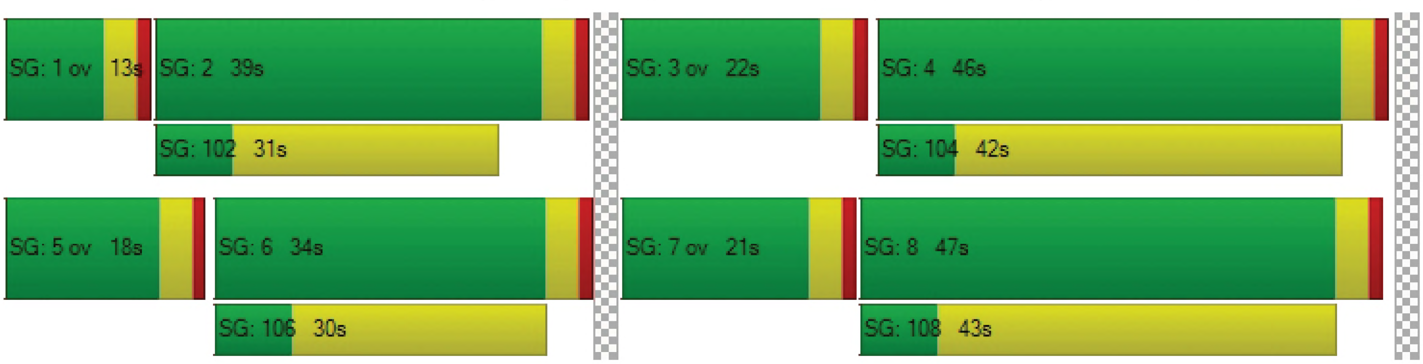
d_M, Delay for Movement [s/veh]	61.47	11.78	6.00	58.24	8.66	3.54	64.47	57.10	44.01	64.62	55.93	46.37
Movement LOS	E	B	A	E	A	A	E	E	D	E	E	D
d_A, Approach Delay [s/veh]	15.42			18.68			57.15			53.14		
Approach LOS	B			B			E			D		
d_I, Intersection Delay [s/veh]	26.26											
Intersection LOS	C											
Intersection V/C	0.517											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.51	49.51	49.51	49.51
I_p,int, Pedestrian LOS Score for Intersection	3.100	3.127	2.585	2.642
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	500	583	717	700
d_b, Bicycle Delay [s]	33.76	30.11	24.71	25.36
I_b,int, Bicycle LOS Score for Intersection	2.236	2.222	1.846	1.920
Bicycle LOS	B	B	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report

Intersection 3: Tippecanoe Avenue at Orange Show Rd/San Bernardino Ave

Control Type:	Signalized	Delay (sec / veh):	27.7
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.665

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Orange Show Rd			San Bernardino Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Orange Show Rd			San Bernardino Ave		
Base Volume Input [veh/h]	91	815	95	139	706	65	168	236	118	92	163	139
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	91	815	95	139	706	65	168	236	118	92	163	139
Peak Hour Factor	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	26	231	27	39	200	18	48	67	33	26	46	39
Total Analysis Volume [veh/h]	103	925	108	158	801	74	191	268	134	104	185	158
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Permi	Protec	Permi	Permi	ProtP	Permi	Permi	ProtP	Permi	Permi
Signal Group	1	6	0	5	2	0	3	8	0	7	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	8	0	5	8	0	5	8	0	5	8	0
Maximum Green [s]	30	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	18	42	0	11	35	0	12	35	0	12	35	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	22	0	0	24	0	0	24	0	0	24	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	No		No	No		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	L	C	C
C, Cycle Length [s]	100	100	100	100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00
g_i, Effective Green Time [s]	8	55	55	7	54	54	26	16	16	26	14	14
g / C, Green / Cycle	0.08	0.55	0.55	0.07	0.54	0.54	0.26	0.16	0.16	0.26	0.14	0.14
(v / s)_i Volume / Saturation Flow Rate	0.06	0.30	0.30	0.05	0.25	0.25	0.15	0.12	0.12	0.09	0.10	0.11
s, saturation flow rate [veh/h]	1593	1772	1707	2912	1772	1719	1250	1772	1576	1187	1772	1511
c, Capacity [veh/h]	127	971	936	204	954	926	327	273	243	302	251	214
d1, Uniform Delay [s]	45.29	14.51	14.52	45.73	14.20	14.20	31.63	40.60	40.69	29.88	41.03	41.24
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	11.66	2.16	2.25	6.19	1.63	1.68	1.66	4.61	5.53	0.67	3.91	5.33
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.81	0.54	0.54	0.77	0.47	0.47	0.58	0.77	0.79	0.34	0.72	0.75
d, Delay for Lane Group [s/veh]	56.95	16.67	16.76	51.92	15.83	15.88	33.29	45.21	46.23	30.56	44.94	46.58
Lane Group LOS	E	B	B	D	B	B	C	D	D	C	D	D
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	2.91	7.85	7.59	2.09	6.34	6.17	3.96	5.28	4.84	2.01	4.50	4.10
50th-Percentile Queue Length [ft/ln]	72.72	196.1	189.8	52.31	158.6	154.2	99.12	131.9	121.0	50.30	112.4	102.5
95th-Percentile Queue Length [veh/ln]	5.24	12.44	12.11	3.77	10.47	10.25	7.14	9.04	8.45	3.62	7.97	7.38
95th-Percentile Queue Length [ft/ln]	130.8	310.9	302.8	94.15	261.8	256.1	178.4	226.0	211.2	90.54	199.3	184.5

Movement, Approach, & Intersection Results

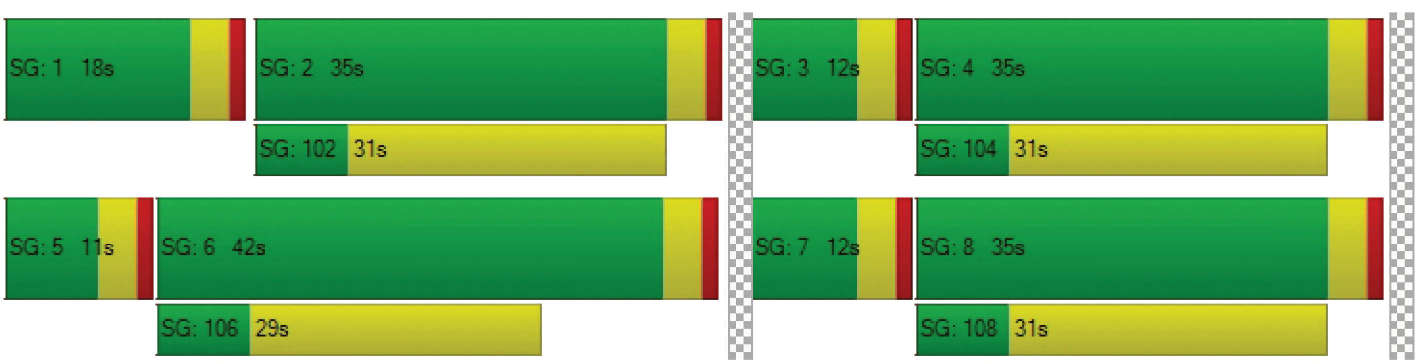
d_M, Delay for Movement [s/veh]	56.95	16.71	16.76	51.92	15.85	15.88	33.29	45.43	46.23	30.56	44.97	46.58
Movement LOS	E	B	B	D	B	B	C	D	D	C	D	D
d_A, Approach Delay [s/veh]		20.37			21.37			41.70			42.19	
Approach LOS		C			C			D			D	
d_I, Intersection Delay [s/veh]	27.67											
Intersection LOS	C											
Intersection V/C	0.665											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	39.61	39.61	39.61	39.61
I_p,int, Pedestrian LOS Score for Intersection	2.755	2.877	2.491	2.496
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	760	620	620	620
d_b, Bicycle Delay [s]	19.22	23.81	23.81	23.81
I_b,int, Bicycle LOS Score for Intersection	2.497	2.412	2.049	1.928
Bicycle LOS	B	B	B	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report

Intersection 4: Tippecanoe Avenue at Harriman Place/I-10 WB Ramps

Control Type:	Signalized	Delay (sec / veh):	28.0
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.539

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Harriman Pl			I-10 WB Ramps		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Harriman Pl			I-10 WB Ramps		
Base Volume Input [veh/h]	174	732	382	0	765	64	47	0	211	555	162	352
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	174	732	382	0	765	64	47	0	211	555	162	352
Peak Hour Factor	0.962	0.962	0.962	1.000	0.962	0.962	0.962	1.000	0.962	0.962	0.962	0.962
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	45	190	99	0	199	17	12	0	55	144	42	91
Total Analysis Volume [veh/h]	181	761	397	0	795	67	49	0	219	577	168	366
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	110
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Protec	Permi	Unsig	Permi	Permi	Permi	Split	Permi	Overla	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	0	3	7	4	0
Auxiliary Signal Groups									1,3			
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	8	8	0	0	8	0	8	0	8	6	8	0
Maximum Green [s]	30	30	0	0	30	0	30	0	30	30	30	0
Amber [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0
Split [s]	12	47	0	0	35	0	12	0	12	10	51	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	21	0	0	24	0	0	0	0	0	39	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0
Minimum Recall	No	No			No		No		No		No	
Maximum Recall	No	No			No		No		No		No	
Pedestrian Recall	No	No			No		No		No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	C	L	R	L	C	R
C, Cycle Length [s]	110	110	110	110	110	110	110	110	110
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	8	64	52	52	8	50	26	26	26
g / C, Green / Cycle	0.07	0.58	0.47	0.47	0.07	0.46	0.24	0.24	0.24
(v / s)_i Volume / Saturation Flow Rate	0.06	0.16	0.13	0.13	0.03	0.08	0.21	0.16	0.18
s, saturation flow rate [veh/h]	2912	4826	4826	1679	1593	2665	2752	1663	1506
c, Capacity [veh/h]	214	2788	2259	786	117	1224	671	399	361
d1, Uniform Delay [s]	50.39	11.65	17.99	17.87	48.76	17.53	40.35	37.90	38.67
k, delay calibration	0.11	0.50	0.50	0.50	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	8.87	0.24	0.32	0.86	2.37	0.07	3.39	1.95	2.98
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.85	0.27	0.29	0.27	0.42	0.18	0.86	0.67	0.74
d, Delay for Lane Group [s/veh]	59.26	11.89	18.31	18.74	51.14	17.60	43.73	39.85	41.65
Lane Group LOS	E	B	B	B	D	B	D	D	D
Critical Lane Group	Yes	No	Yes	No	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	2.72	3.08	3.39	3.49	1.36	1.64	7.76	6.69	6.91
50th-Percentile Queue Length [ft/ln]	67.99	76.91	84.74	87.24	34.10	41.07	193.9	167.3	172.6
95th-Percentile Queue Length [veh/ln]	4.89	5.54	6.10	6.28	2.45	2.96	12.33	10.93	11.22
95th-Percentile Queue Length [ft/ln]	122.37	138.44	152.53	157.03	61.37	73.92	308.1	273.3	280.4

Movement, Approach, & Intersection Results

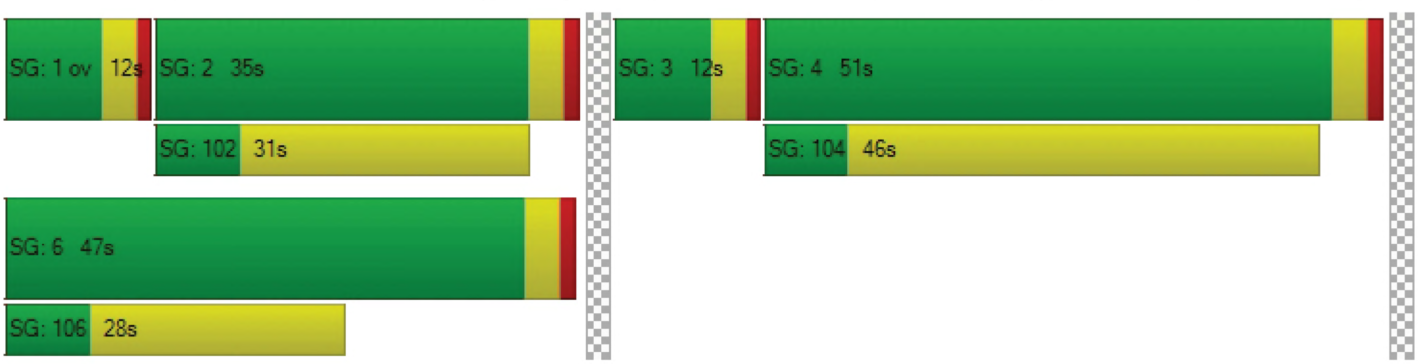
d_M, Delay for Movement [s/veh]	59.26	11.89	0.00	0.00	18.39	18.74	51.14	0.00	17.60	43.73	39.85	41.16
Movement LOS	E	B			B	B	D		B	D	D	D
d_A, Approach Delay [s/veh]	20.99			18.42			23.73			42.30		
Approach LOS	C			B			C			D		
d_I, Intersection Delay [s/veh]	27.96											
Intersection LOS	C											
Intersection V/C	0.539											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	44.58	44.58	44.58
I_p,int, Pedestrian LOS Score for Intersection	0.000	2.887	2.443	2.526
Crosswalk LOS	F	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	781	563	145	854
d_b, Bicycle Delay [s]	20.43	28.39	47.32	18.06
I_b,int, Bicycle LOS Score for Intersection	2.078	1.915	1.560	3.393
Bicycle LOS	B	A	A	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Tippecanoe Avenue/Anderson Street at I-10 EB Ramps

Control Type:	Signalized	Delay (sec / veh):	22.5
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.647

Intersection Setup

Name	Tippecanoe Ave			Anderson St			I-10 EB Ramps			I-10 EB Ramps		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No					
Crosswalk	No			No			No			Yes		

Volumes

Name	Tippecanoe Ave			Anderson St			I-10 EB Ramps			I-10 EB Ramps		
Base Volume Input [veh/h]	0	665	304	203	842	0	623	3	673	0	0	0
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	665	304	203	842	0	623	3	673	0	0	0
Peak Hour Factor	1.000	0.935	0.935	0.935	0.935	1.000	0.935	0.935	0.935	1.000	1.000	1.000
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	0	178	81	54	225	0	167	1	180	0	0	0
Total Analysis Volume [veh/h]	0	711	325	217	901	0	666	3	720	0	0	0
Presence of On-Street Parking	No		No	No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]		0			0			0			0	
v_di, Inbound Pedestrian Volume crossing major street [ped/h]		0			0			0			0	
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]		0			0			0			0	
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]		0			0			0			0	
v_ab, Corner Pedestrian Volume [ped/h]		0			0			0			0	
Bicycle Volume [bicycles/h]		0			0			0			0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permi	Permi	Permi	Protec	Permi	Permi	Split	Split	Split	Permi	Permi	Permi
Signal Group	0	6	0	5	2	0	0	8	0	0	0	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	0	8	0	8	8	0	0	8	0	0	0	0
Maximum Green [s]	0	30	0	30	30	0	0	30	0	0	0	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
Split [s]	0	25	0	12	37	0	0	53	0	0	0	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Walk [s]	0	7	0	0	0	0	0	0	0	0	0	0
Pedestrian Clearance [s]	0	14	0	0	0	0	0	0	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No				
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Minimum Recall		No		No	No			No				
Maximum Recall		No		No	No			No				
Pedestrian Recall		No		No	No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	R	L	C	L	C	R	
C, Cycle Length [s]	90	90	90	90	90	90	90	
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]	41	41	8	53	29	29	29	
g / C, Green / Cycle	0.46	0.46	0.09	0.59	0.32	0.32	0.32	
(v / s)_i Volume / Saturation Flow Rate	0.21	0.22	0.07	0.27	0.21	0.21	0.27	
s, saturation flow rate [veh/h]	3373	1506	2912	3373	1593	1594	2665	
c, Capacity [veh/h]	1535	685	262	1988	513	513	858	
d1, Uniform Delay [s]	16.94	17.05	40.30	10.37	26.20	26.20	28.36	
k, delay calibration	0.50	0.50	0.11	0.50	0.11	0.11	0.11	
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]	1.01	2.35	6.67	0.75	1.41	1.41	2.29	
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity	0.46	0.47	0.83	0.45	0.65	0.65	0.84	
d, Delay for Lane Group [s/veh]	17.95	19.40	46.97	11.11	27.61	27.60	30.65	
Lane Group LOS	B	B	D	B	C	C	C	
Critical Lane Group	No	Yes	Yes	No	No	No	Yes	
50th-Percentile Queue Length [veh/ln]	5.05	4.89	2.57	4.75	6.16	6.16	7.22	
50th-Percentile Queue Length [ft/ln]	126.20	122.34	64.34	118.65	154.0	153.9	180.4	
95th-Percentile Queue Length [veh/ln]	8.73	8.52	4.63	8.32	10.23	10.23	11.62	
95th-Percentile Queue Length [ft/ln]	218.32	213.04	115.82	207.97	255.7	255.7	290.5	

Movement, Approach, & Intersection Results

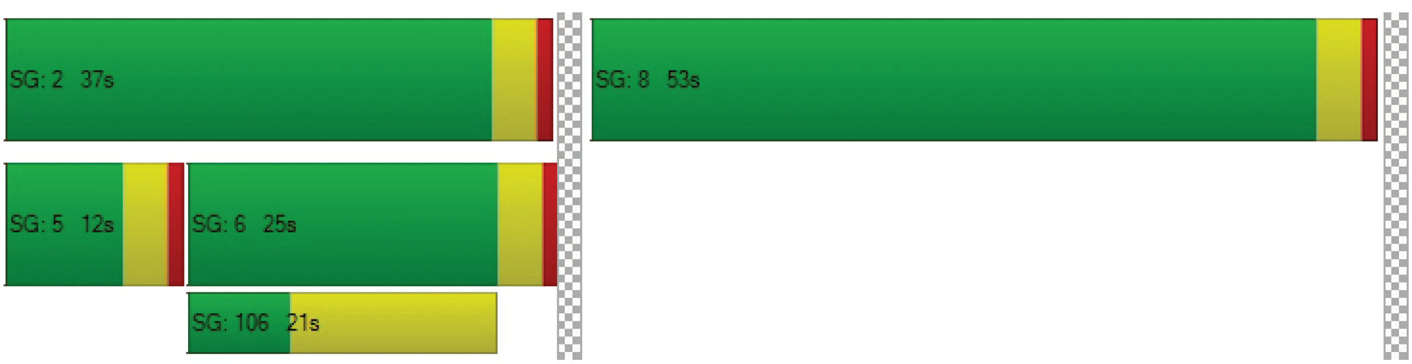
d_M, Delay for Movement [s/veh]	0.00	17.95	19.40	46.97	11.11	0.00	27.61	27.60	30.65	0.00	0.00	0.00
Movement LOS		B	B	D	B		C	C	C			
d_A, Approach Delay [s/veh]	18.41			18.07			29.19			0.00		
Approach LOS	B			B			C			A		
d_I, Intersection Delay [s/veh]	22.53											
Intersection LOS	C											
Intersection V/C	0.647											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	34.68
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	1.980
Crosswalk LOS	F	F	F	A
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	467	733	1089	0
d_b, Bicycle Delay [s]	26.46	18.06	9.35	45.01
I_b,int, Bicycle LOS Score for Intersection	2.414	2.482	3.851	4.132
Bicycle LOS	B	B	D	D

Sequence

Ring 1	-	2	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 1: Tippecanoe Avenue at Mill Street

Control Type:	Signalized	Delay (sec / veh):	18.1
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.493

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Mill Street			Mill Street		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			No			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Mill Street			Mill Street		
Base Volume Input [veh/h]	82	1208	0	1	871	201	246	14	249	8	11	4
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	82	1208	0	1	871	201	246	14	249	8	11	4
Peak Hour Factor	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	23	340	0	0	245	57	69	4	70	2	3	1
Total Analysis Volume [veh/h]	92	1359	0	1	980	226	277	16	280	9	12	4
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Permi	Protec	Permi	Overla	Split	Split	Overla	Split	Split	Split
Signal Group	1	6	0	5	2	2	0	8	8	0	4	0
Auxiliary Signal Groups						2,8			1,8			
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	5	8	0	5	8	8	0	8	8	0	8	0
Maximum Green [s]	30	30	0	30	30	30	0	30	30	0	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	0.0
Split [s]	16	52	0	9	45	45	0	47	47	0	12	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	7	0	7	7	0	0	0
Pedestrian Clearance [s]	0	41	0	0	24	24	0	36	36	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	0.0
Minimum Recall	No	No		No	No	No		No	No		No	
Maximum Recall	No	No		No	No	No		No	No		No	
Pedestrian Recall	No	No		No	No	No		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	R	L	C	R	L	C	R
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	12	84	84	0	73	100	15	15	31	5	5	5
g / C, Green / Cycle	0.10	0.70	0.70	0.00	0.61	0.83	0.12	0.12	0.26	0.04	0.04	0.04
(v / s)_i Volume / Saturation Flow Rate	0.06	0.26	0.26	0.00	0.20	0.15	0.09	0.09	0.19	0.01	0.00	0.00
s, saturation flow rate [veh/h]	1593	3373	1772	1593	4826	1506	1593	1602	1506	1593	3373	1506
c, Capacity [veh/h]	160	2372	1246	3	2918	1254	197	198	387	61	129	57
d1, Uniform Delay [s]	51.56	7.19	7.19	59.83	11.77	1.97	50.75	50.75	40.68	55.84	55.72	55.67
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.26	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	3.25	0.46	0.87	56.60	0.31	0.32	5.43	5.40	6.08	1.11	0.31	0.51
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.58	0.38	0.38	0.34	0.34	0.18	0.74	0.74	0.72	0.15	0.09	0.07
d, Delay for Lane Group [s/veh]	54.81	7.64	8.06	116.4	12.08	2.28	56.18	56.15	46.76	56.95	56.03	56.18
Lane Group LOS	D	A	A	F	B	A	E	E	D	E	E	E
Critical Lane Group	No	Yes	No	Yes	No	No	No	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	2.79	4.39	4.75	0.08	4.30	0.82	4.53	4.56	8.18	0.28	0.18	0.13
50th-Percentile Queue Length [ft/ln]	69.79	109.6	118.7	1.92	107.4	20.54	113.3	113.8	204.5	7.07	4.53	3.13
95th-Percentile Queue Length [veh/ln]	5.02	7.82	8.32	0.14	7.70	1.48	8.03	8.06	12.87	0.51	0.33	0.23
95th-Percentile Queue Length [ft/ln]	125.6	195.4	208.0	3.46	192.4	36.96	200.6	201.4	321.8	12.73	8.16	5.63

Movement, Approach, & Intersection Results

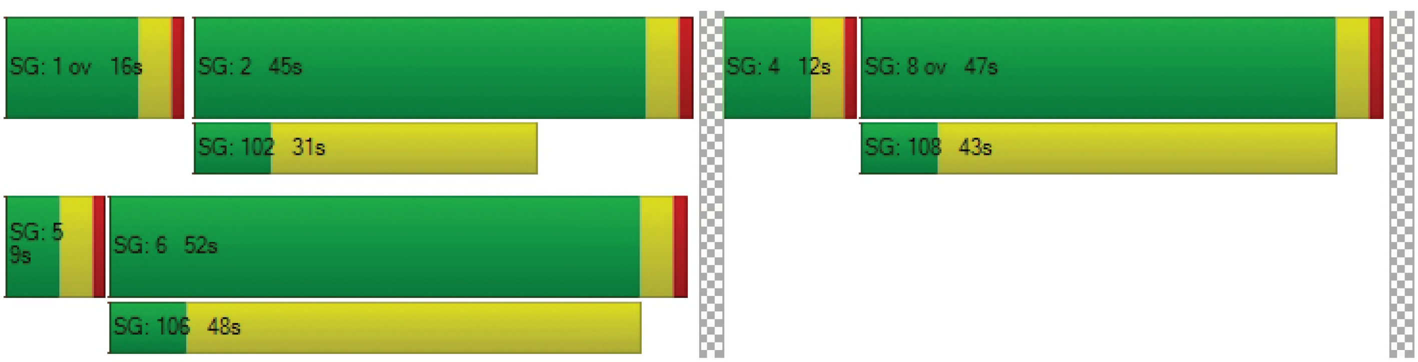
d_M, Delay for Movement [s/veh]	54.81	7.79	8.06	116.4	12.08	2.28	56.17	56.15	46.76	56.95	56.03	56.18
Movement LOS	D	A	A	F	B	A	E	E	D	E	E	E
d_A, Approach Delay [s/veh]	10.77			10.33			51.57			56.39		
Approach LOS	B			B			D			E		
d_I, Intersection Delay [s/veh]	18.14											
Intersection LOS	B											
Intersection V/C	0.493											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.51	0.00	49.51	49.51
I_p,int, Pedestrian LOS Score for Intersection	2.987	0.000	2.490	2.322
Crosswalk LOS	C	F	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	800	683	717	133
d_b, Bicycle Delay [s]	21.61	26.01	24.71	52.27
I_b,int, Bicycle LOS Score for Intersection	2.358	2.223	2.505	1.580
Bicycle LOS	B	B	B	A

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Tippecanoe Avenue at Central Avenue

Control Type:	Signalized	Delay (sec / veh):	27.3
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.546

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Central Avenue			Central Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Central Avenue			Central Avenue		
Base Volume Input [veh/h]	118	879	84	199	827	148	154	113	59	118	162	199
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	118	879	84	199	827	148	154	113	59	118	162	199
Peak Hour Factor	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	31	228	22	52	215	38	40	29	15	31	42	52
Total Analysis Volume [veh/h]	123	914	87	207	860	154	160	117	61	123	168	207
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	115
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Overla	Protec	Permi	Overla	Protec	Permi	Overla	Protec	Permi	Overla
Signal Group	1	6	6	5	2	2	3	8	8	7	4	4
Auxiliary Signal Groups			6,7			2,3			1,8			4,5
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	8	8	5	8	8	5	8	8	5	8	8
Maximum Green [s]	30	30	30	30	30	30	30	30	30	30	30	30
Amber [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Split [s]	9	34	34	16	41	41	19	47	47	18	46	46
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Walk [s]	0	7	7	0	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	0	23	23	0	24	24	0	36	36	0	35	35
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Recall	No	No	No	No	No	No	No	No	No	No	No	No
Maximum Recall	No	No	No	No	No	No	No	No	No	No	No	No
Pedestrian Recall	No	No	No	No	No	No	No	No	No	No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	R	L	C	R
C, Cycle Length [s]	115	115	115	115	115	115	115	115	115	115	115	115
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00
g_i, Effective Green Time [s]	5	65	80	12	72	89	13	11	20	11	9	25
g / C, Green / Cycle	0.04	0.57	0.69	0.10	0.63	0.78	0.12	0.10	0.18	0.09	0.07	0.21
(v / s)_i Volume / Saturation Flow Rate	0.04	0.19	0.06	0.07	0.18	0.10	0.10	0.03	0.04	0.08	0.05	0.14
s, saturation flow rate [veh/h]	2912	4826	1506	2912	4826	1506	1593	3373	1506	1593	3373	1506
c, Capacity [veh/h]	129	2724	1043	305	3016	1170	187	331	267	149	251	322
d1, Uniform Delay [s]	54.87	13.46	5.77	49.63	9.84	3.19	49.85	48.47	40.59	51.25	51.88	41.21
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	26.98	0.33	0.16	2.63	0.24	0.23	10.69	0.64	0.43	10.92	3.07	2.14
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.95	0.34	0.08	0.68	0.29	0.13	0.86	0.35	0.23	0.83	0.67	0.64
d, Delay for Lane Group [s/veh]	81.85	13.80	5.93	52.27	10.08	3.42	60.54	49.11	41.02	62.17	54.94	43.35
Lane Group LOS	F	B	A	D	B	A	E	D	D	E	D	D
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	2.26	4.22	0.68	2.98	3.23	0.80	5.06	1.60	1.52	3.93	2.47	5.53
50th-Percentile Queue Length [ft/ln]	56.50	105.5	17.11	74.46	80.73	19.99	126.5	40.04	38.04	98.25	61.69	138.2
95th-Percentile Queue Length [veh/ln]	4.07	7.59	1.23	5.36	5.81	1.44	8.75	2.88	2.74	7.07	4.44	9.39
95th-Percentile Queue Length [ft/ln]	101.7	189.7	30.81	134.0	145.3	35.98	218.7	72.07	68.46	176.8	111.0	234.7

Movement, Approach, & Intersection Results

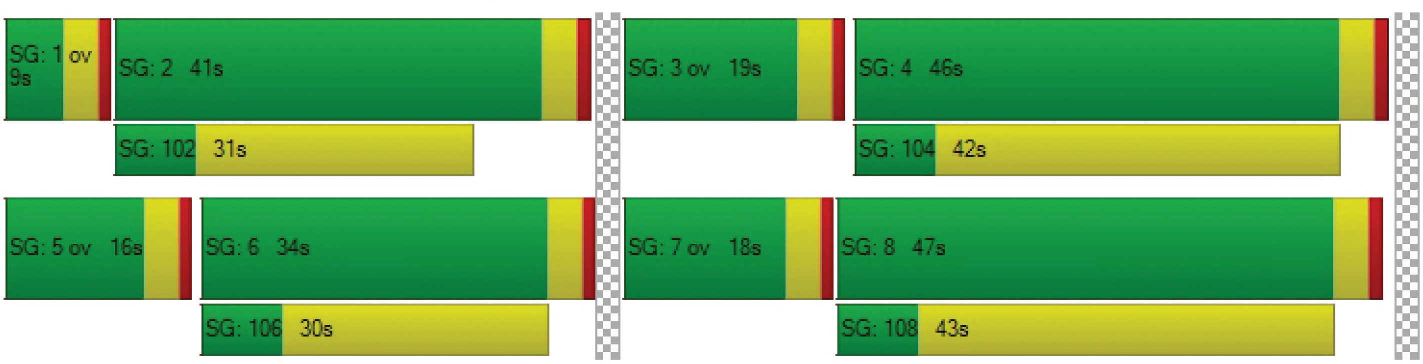
d_M, Delay for Movement [s/veh]	81.85	13.80	5.93	52.27	10.08	3.42	60.54	49.11	41.02	62.17	54.94	43.35
Movement LOS	F	B	A	D	B	A	E	D	D	E	D	D
d_A, Approach Delay [s/veh]	20.64			16.39			53.06			51.91		
Approach LOS	C			B			D			D		
d_I, Intersection Delay [s/veh]	27.35											
Intersection LOS	C											
Intersection V/C	0.546											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	47.05	47.05	47.05	47.05
I_p,int, Pedestrian LOS Score for Intersection	3.096	3.132	2.592	2.612
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	522	643	748	730
d_b, Bicycle Delay [s]	31.43	26.47	22.56	23.19
I_b,int, Bicycle LOS Score for Intersection	2.178	2.231	1.838	1.970
Bicycle LOS	B	B	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Tippecanoe Avenue at Orange Show Rd/San Bernardino Ave

Control Type:	Signalized	Delay (sec / veh):	30.2
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.769

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Orange Show Rd			San Bernardino Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Orange Show Rd			San Bernardino Ave		
Base Volume Input [veh/h]	97	877	104	226	823	70	175	390	125	69	306	189
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	97	877	104	226	823	70	175	390	125	69	306	189
Peak Hour Factor	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	26	236	28	61	222	19	47	105	34	19	82	51
Total Analysis Volume [veh/h]	105	945	112	244	887	75	189	420	135	74	330	204
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	95
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Permi	Protec	Permi	Permi	ProtP	Permi	Permi	ProtP	Permi	Permi
Signal Group	1	6	0	5	2	0	3	8	0	7	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	8	0	5	8	0	5	8	0	5	8	0
Maximum Green [s]	30	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	12	33	0	14	35	0	10	39	0	9	38	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	22	0	0	24	0	0	24	0	0	24	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	No		No	No		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	L	C	C
C, Cycle Length [s]	95	95	95	95	95	95	95	95	95	95	95	95
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00
g_i, Effective Green Time [s]	8	42	42	10	44	44	31	23	23	31	21	21
g / C, Green / Cycle	0.08	0.44	0.44	0.10	0.46	0.46	0.33	0.24	0.24	0.33	0.22	0.22
(v / s)_i Volume / Saturation Flow Rate	0.07	0.30	0.30	0.08	0.28	0.28	0.18	0.16	0.16	0.07	0.16	0.16
s, saturation flow rate [veh/h]	1593	1772	1707	2912	1772	1724	1055	1772	1626	1004	1772	1550
c, Capacity [veh/h]	128	783	754	300	823	800	327	426	391	315	396	346
d1, Uniform Delay [s]	42.99	21.26	21.27	41.71	18.80	18.81	26.44	32.72	32.75	23.56	34.07	34.19
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.13	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	11.87	4.89	5.09	5.28	3.13	3.22	1.97	1.89	2.08	0.38	2.40	2.91
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.82	0.69	0.69	0.81	0.59	0.59	0.58	0.68	0.68	0.24	0.71	0.73
d, Delay for Lane Group [s/veh]	54.86	26.15	26.36	46.99	21.93	22.04	28.41	34.61	34.83	23.94	36.47	37.10
Lane Group LOS	D	C	C	D	C	C	C	C	C	C	D	D
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	2.83	10.21	9.90	2.99	8.27	8.09	3.36	6.14	5.69	1.18	6.18	5.57
50th-Percentile Queue Length [ft/ln]	70.67	255.3	247.4	74.70	206.8	202.1	84.01	153.5	142.2	29.61	154.5	139.2
95th-Percentile Queue Length [veh/ln]	5.09	15.45	15.06	5.38	12.99	12.75	6.05	10.21	9.60	2.13	10.26	9.44
95th-Percentile Queue Length [ft/ln]	127.2	386.3	376.4	134.4	324.7	318.7	151.2	255.2	240.0	53.29	256.5	235.9

Movement, Approach, & Intersection Results

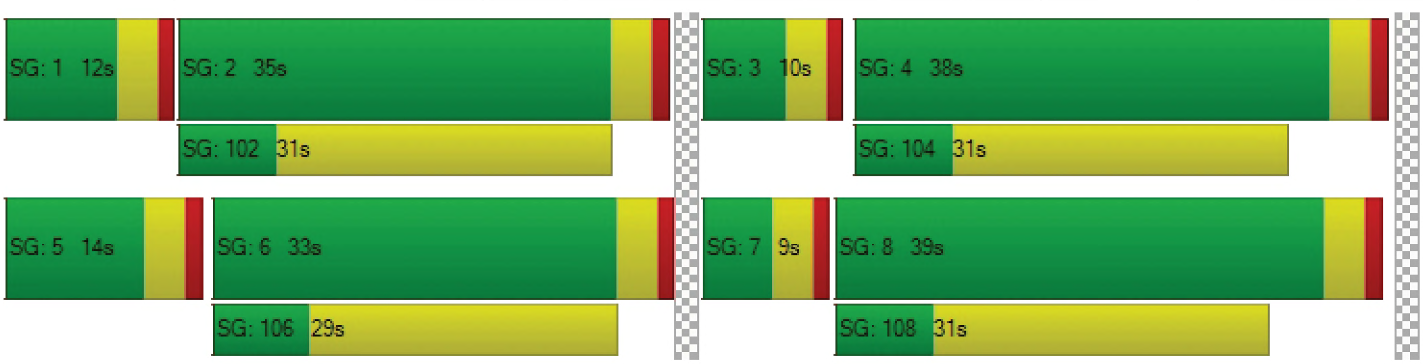
d_M, Delay for Movement [s/veh]	54.86	26.24	26.36	46.99	21.98	22.04	28.41	34.68	34.83	23.94	36.56	37.10
Movement LOS	D	C	C	D	C	C	C	C	C	C	D	D
d_A, Approach Delay [s/veh]	28.84			27.04			33.12			35.20		
Approach LOS	C			C			C			D		
d_I, Intersection Delay [s/veh]	30.15											
Intersection LOS	C											
Intersection V/C	0.769											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	37.14	37.14	37.14	37.14
I_p,int, Pedestrian LOS Score for Intersection	2.770	2.934	2.547	2.572
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	611	653	737	716
d_b, Bicycle Delay [s]	22.93	21.56	18.95	19.59
I_b,int, Bicycle LOS Score for Intersection	2.518	2.555	2.173	2.061
Bicycle LOS	B	B	B	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Tippecanoe Avenue at Harriman Place/I-10 WB Ramps

Control Type:	Signalized	Delay (sec / veh):	34.4
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.848

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Harriman Pl			I-10 WB Ramps		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Harriman Pl			I-10 WB Ramps		
Base Volume Input [veh/h]	328	678	595	0	1161	182	157	0	631	226	253	356
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	328	678	595	0	1161	182	157	0	631	226	253	356
Peak Hour Factor	0.949	0.949	0.949	1.000	0.949	0.949	0.949	1.000	0.949	0.949	0.949	0.949
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	86	179	157	0	306	48	41	0	166	60	67	94
Total Analysis Volume [veh/h]	346	714	627	0	1223	192	165	0	665	238	267	375
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Protec	Permi	Unsig	Permi	Permi	Permi	Split	Permi	Overla	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	0	3	7	4	0
Auxiliary Signal Groups									1,3			
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	8	8	0	0	8	0	8	0	8	6	8	0
Maximum Green [s]	30	30	0	0	30	0	30	0	30	30	30	0
Amber [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0
Split [s]	18	53	0	0	35	0	17	0	17	10	50	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	21	0	0	24	0	0	0	0	0	39	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0
Minimum Recall	No	No			No		No		No		No	
Maximum Recall	No	No			No		No		No		No	
Pedestrian Recall	No	No			No		No		No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	C	L	R	L	C	R
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	14	67	49	49	13	63	28	28	28
g / C, Green / Cycle	0.12	0.56	0.41	0.41	0.11	0.53	0.23	0.23	0.23
(v / s)_i Volume / Saturation Flow Rate	0.12	0.15	0.22	0.22	0.10	0.25	0.09	0.19	0.21
s, saturation flow rate [veh/h]	2912	4826	4826	1617	1593	2665	2752	1715	1506
c, Capacity [veh/h]	341	2689	1963	658	173	1403	657	401	352
d1, Uniform Delay [s]	53.00	13.81	27.08	27.04	53.18	17.93	38.64	43.58	44.48
k, delay calibration	0.11	0.50	0.50	0.50	0.11	0.11	0.11	0.11	0.13
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	26.25	0.24	1.07	3.14	21.93	0.25	0.34	4.18	8.75
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.01	0.27	0.54	0.54	0.95	0.47	0.36	0.82	0.89
d, Delay for Lane Group [s/veh]	79.25	14.05	28.15	30.18	75.12	18.18	38.97	47.76	53.24
Lane Group LOS	F	B	C	C	E	B	D	D	D
Critical Lane Group	Yes	No	Yes	No	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	6.37	3.37	7.85	8.21	6.00	5.77	2.99	9.68	9.82
50th-Percentile Queue Length [ft/ln]	159.37	84.36	196.17	205.36	149.91	144.34	74.66	242.0	245.5
95th-Percentile Queue Length [veh/ln]	10.58	6.07	12.44	12.91	10.01	9.71	5.38	14.78	14.96
95th-Percentile Queue Length [ft/ln]	264.38	151.85	311.02	322.86	250.31	242.86	134.3	369.5	374.0

Movement, Approach, & Intersection Results

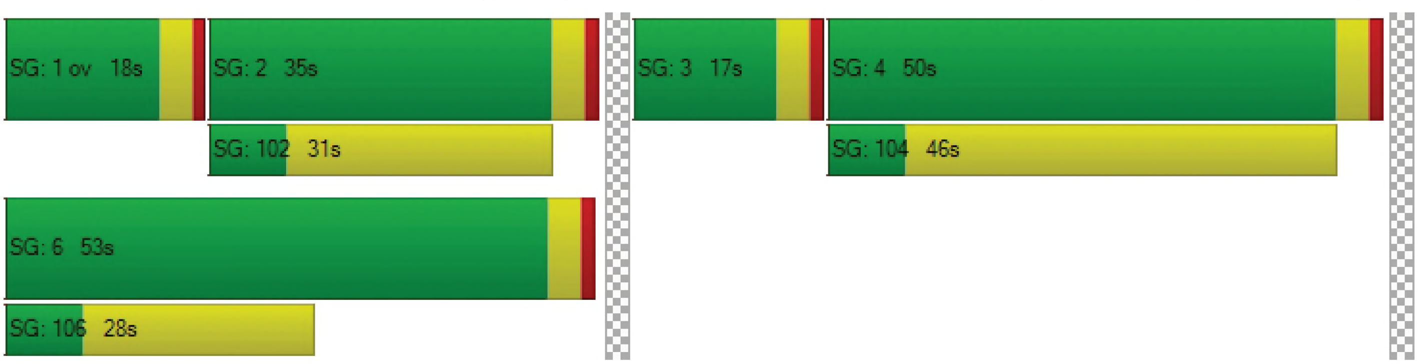
d_M, Delay for Movement [s/veh]	79.25	14.05	0.00	0.00	28.42	30.18	75.12	0.00	18.18	38.97	47.76	52.41
Movement LOS	F	B			C	C	E		B	D	D	D
d_A, Approach Delay [s/veh]	35.33			28.66			29.50			47.33		
Approach LOS	D			C			C			D		
d_I, Intersection Delay [s/veh]	34.44											
Intersection LOS	C											
Intersection V/C	0.848											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	49.52	49.52	49.52
I_p,int, Pedestrian LOS Score for Intersection	0.000	2.979	2.632	2.485
Crosswalk LOS	F	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	816	517	217	766
d_b, Bicycle Delay [s]	21.02	33.02	47.72	22.83
I_b,int, Bicycle LOS Score for Intersection	2.143	2.143	1.560	3.012
Bicycle LOS	B	B	A	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Tippecanoe Avenue/Anderson Street at I-10 EB Ramps

Control Type:	Signalized	Delay (sec / veh):	26.7
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.810

Intersection Setup

Name	Tippecanoe Ave			Anderson St			I-10 EB Ramps			I-10 EB Ramps		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No					
Crosswalk	No			No			No			Yes		

Volumes

Name	Tippecanoe Ave			Anderson St			I-10 EB Ramps			I-10 EB Ramps		
Base Volume Input [veh/h]	0	1187	356	636	822	0	396	3	306	0	0	0
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	1187	356	636	822	0	396	3	306	0	0	0
Peak Hour Factor	1.000	0.976	0.976	0.976	0.976	1.000	0.976	0.976	0.976	1.000	1.000	1.000
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	0	304	91	163	211	0	101	1	78	0	0	0
Total Analysis Volume [veh/h]	0	1216	365	652	842	0	406	3	314	0	0	0
Presence of On-Street Parking	No		No	No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permi	Permi	Permi	Protec	Permi	Permi	Split	Split	Split	Permi	Permi	Permi
Signal Group	0	6	0	5	2	0	0	8	0	0	0	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	0	8	0	8	8	0	0	8	0	0	0	0
Maximum Green [s]	0	30	0	30	30	0	0	30	0	0	0	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
Split [s]	0	25	0	56	81	0	0	19	0	0	0	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Walk [s]	0	7	0	0	0	0	0	0	0	0	0	0
Pedestrian Clearance [s]	0	14	0	0	0	0	0	0	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No				
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Minimum Recall		No		No	No			No				
Maximum Recall		No		No	No			No				
Pedestrian Recall		No		No	No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	R	L	C	L	C	R	
C, Cycle Length [s]	100	100	100	100	100	100	100	
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]	48	48	26	77	15	15	15	
g / C, Green / Cycle	0.48	0.48	0.26	0.77	0.15	0.15	0.15	
(v / s)_i Volume / Saturation Flow Rate	0.36	0.24	0.22	0.25	0.13	0.13	0.12	
s, saturation flow rate [veh/h]	3373	1506	2912	3373	1593	1595	2665	
c, Capacity [veh/h]	1611	719	744	2607	234	235	392	
d1, Uniform Delay [s]	21.35	18.02	35.72	3.44	41.72	41.72	41.23	
k, delay calibration	0.50	0.50	0.11	0.50	0.11	0.11	0.11	
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]	3.34	2.55	3.50	0.33	9.67	9.66	3.82	
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity	0.75	0.51	0.88	0.32	0.87	0.87	0.80	
d, Delay for Lane Group [s/veh]	24.69	20.57	39.22	3.77	51.40	51.38	45.05	
Lane Group LOS	C	C	D	A	D	D	D	
Critical Lane Group	Yes	No	Yes	No	Yes	No	No	
50th-Percentile Queue Length [veh/ln]	11.80	6.11	7.84	2.04	5.51	5.51	3.91	
50th-Percentile Queue Length [ft/ln]	295.00	152.76	195.96	50.96	137.7	137.8	97.80	
95th-Percentile Queue Length [veh/ln]	17.43	10.16	12.43	3.67	9.36	9.36	7.04	
95th-Percentile Queue Length [ft/ln]	435.84	254.10	310.75	91.73	234.0	234.0	176.0	

Movement, Approach, & Intersection Results

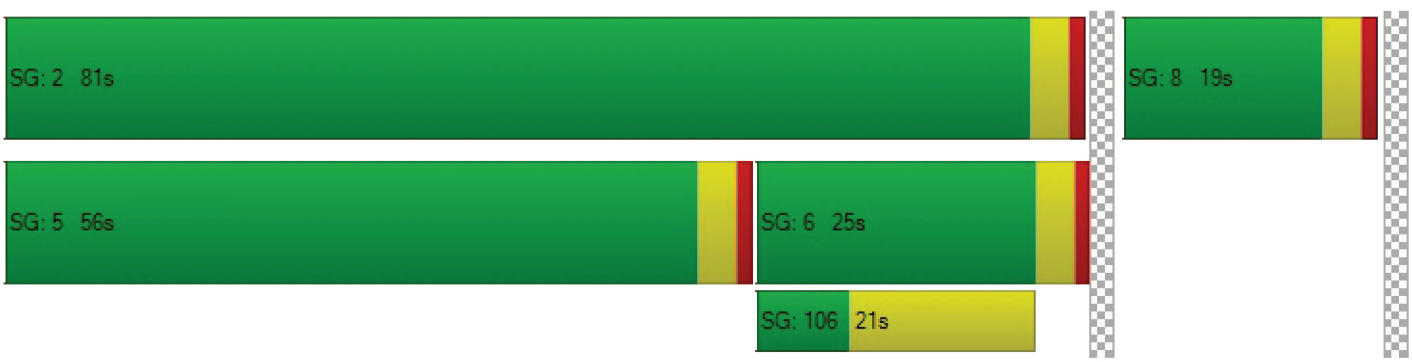
d_M, Delay for Movement [s/veh]	0.00	24.69	20.57	39.22	3.77	0.00	51.39	51.38	45.05	0.00	0.00	0.00
Movement LOS		C	C	D	A		D	D	D			
d_A, Approach Delay [s/veh]	23.74			19.24			48.64			0.00		
Approach LOS	C			B			D			A		
d_I, Intersection Delay [s/veh]	26.71											
Intersection LOS	C											
Intersection V/C	0.810											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	39.61
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	2.217
Crosswalk LOS	F	F	F	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	420	1540	300	0
d_b, Bicycle Delay [s]	31.21	2.65	36.13	50.00
I_b,int, Bicycle LOS Score for Intersection	2.864	2.792	2.753	4.132
Bicycle LOS	C	C	C	D

Sequence

Ring 1	-	2	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



APPENDIX D

YEAR 2023 TRAFFIC CONDITIONS
INTERSECTION LEVEL OF SERVICE
CALCULATION WORKSHEETS

APPENDIX D-I

YEAR 2023 WITHOUT PROJECT TRAFFIC CONDITIONS

Intersection Level Of Service Report
Intersection 1: Tippecanoe Avenue at Mill Street

Control Type:	Signalized	Delay (sec / veh):	25.6
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.678

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Mill Street			Mill Street		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			No			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Mill Street			Mill Street		
Base Volume Input [veh/h]	262	993	0	15	1060	116	170	16	226	24	12	2
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	262	993	0	15	1060	116	170	16	226	24	12	2
Peak Hour Factor	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	75	286	0	4	305	33	49	5	65	7	3	1
Total Analysis Volume [veh/h]	301	1143	0	17	1220	133	196	18	260	28	14	2
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Permi	Protec	Permi	Overla	Split	Split	Overla	Split	Split	Split
Signal Group	1	6	0	5	2	2	0	8	8	0	4	0
Auxiliary Signal Groups						2,8			1,8			
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	5	8	0	5	8	8	0	8	8	0	8	0
Maximum Green [s]	30	30	0	30	30	30	0	30	30	0	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	0.0
Split [s]	26	52	0	9	35	35	0	47	47	0	12	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	7	0	7	7	0	0	0
Pedestrian Clearance [s]	0	41	0	0	24	24	0	36	36	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	0.0
Minimum Recall	No	No		No	No	No		No	No		No	
Maximum Recall	No	No		No	No	No		No	No		No	
Pedestrian Recall	No	No		No	No	No		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	R	L	C	R	L	C	R
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	22	84	84	2	64	90	11	11	37	6	6	6
g / C, Green / Cycle	0.18	0.70	0.70	0.02	0.54	0.75	0.10	0.10	0.31	0.05	0.05	0.05
(v / s)_i Volume / Saturation Flow Rate	0.19	0.22	0.22	0.01	0.25	0.09	0.07	0.07	0.17	0.02	0.00	0.00
s, saturation flow rate [veh/h]	1593	3373	1772	1593	4826	1506	1593	1606	1506	1593	3373	1506
c, Capacity [veh/h]	292	2365	1242	29	2588	1129	152	153	470	82	174	78
d1, Uniform Delay [s]	49.01	6.89	6.89	58.44	17.27	4.12	52.65	52.65	34.34	54.93	54.19	54.04
k, delay calibration	0.27	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.22	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	46.66	0.35	0.67	16.54	0.62	0.21	5.79	5.75	2.10	2.41	0.19	0.13
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.03	0.32	0.32	0.58	0.47	0.12	0.70	0.70	0.55	0.34	0.08	0.03
d, Delay for Lane Group [s/veh]	95.67	7.24	7.56	74.97	17.89	4.33	58.44	58.39	36.44	57.34	54.39	54.17
Lane Group LOS	F	A	A	E	B	A	E	E	D	E	D	D
Critical Lane Group	Yes	No	No	No	Yes	No	No	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	12.50	3.52	3.80	0.65	6.99	0.86	3.36	3.39	6.58	0.87	0.21	0.06
50th-Percentile Queue Length [ft/ln]	312.5	87.89	95.07	16.21	174.6	21.55	84.00	84.63	164.4	21.85	5.17	1.51
95th-Percentile Queue Length [veh/ln]	18.58	6.33	6.84	1.17	11.32	1.55	6.05	6.09	10.78	1.57	0.37	0.11
95th-Percentile Queue Length [ft/ln]	464.4	158.2	171.1	29.17	282.9	38.79	151.2	152.3	269.6	39.34	9.30	2.72

Movement, Approach, & Intersection Results

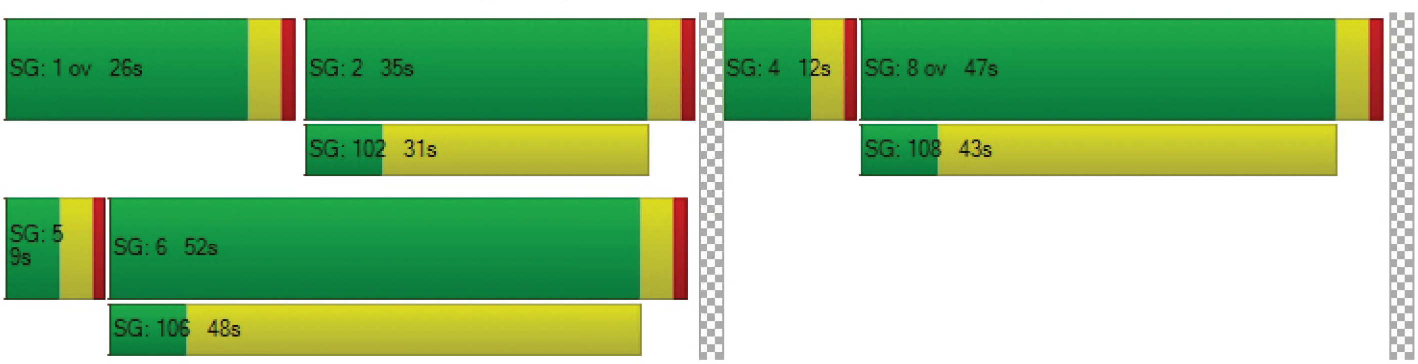
d_M, Delay for Movement [s/veh]	95.67	7.35	7.56	74.97	17.89	4.33	58.42	58.39	36.44	57.34	54.39	54.17
Movement LOS	F	A	A	E	B	A	E	E	D	E	D	D
d_A, Approach Delay [s/veh]	25.76			17.28			46.36			56.26		
Approach LOS	C			B			D			E		
d_I, Intersection Delay [s/veh]	25.61											
Intersection LOS	C											
Intersection V/C	0.678											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.51	0.00	49.51	49.51
I_p,int, Pedestrian LOS Score for Intersection	3.019	0.000	2.493	2.329
Crosswalk LOS	C	F	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	800	517	717	133
d_b, Bicycle Delay [s]	21.61	33.01	24.71	52.27
I_b,int, Bicycle LOS Score for Intersection	2.354	2.313	2.342	1.596
Bicycle LOS	B	B	B	A

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Tippecanoe Avenue at Central Avenue

Control Type:	Signalized	Delay (sec / veh):	28.6
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.603

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Central Avenue			Central Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Central Avenue			Central Avenue		
Base Volume Input [veh/h]	228	972	200	251	1003	126	150	172	64	93	124	209
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	228	972	200	251	1003	126	150	172	64	93	124	209
Peak Hour Factor	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	62	265	54	68	273	34	41	47	17	25	34	57
Total Analysis Volume [veh/h]	248	1059	218	273	1093	137	163	187	70	101	135	228
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]		0			0			0			0	
v_di, Inbound Pedestrian Volume crossing major street [ped/h]		0			0			0			0	
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]		0			0			0			0	
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]		0			0			0			0	
v_ab, Corner Pedestrian Volume [ped/h]		0			0			0			0	
Bicycle Volume [bicycles/h]		0			0			0			0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Overla	Protec	Permi	Overla	Protec	Permi	Overla	Protec	Permi	Overla
Signal Group	1	6	6	5	2	2	3	8	8	7	4	4
Auxiliary Signal Groups			6,7			2,3			1,8			4,5
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	8	8	5	8	8	5	8	8	5	8	8
Maximum Green [s]	30	30	30	30	30	30	30	30	30	30	30	30
Amber [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Split [s]	17	34	34	18	35	35	22	47	47	21	46	46
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Walk [s]	0	7	7	0	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	0	23	23	0	24	24	0	36	36	0	35	35
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Recall	No	No	No	No	No	No	No	No	No	No	No	No
Maximum Recall	No	No	No	No	No	No	No	No	No	No	No	No
Pedestrian Recall	No	No	No	No	No	No	No	No	No	No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	R	L	C	R
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00
g_i, Effective Green Time [s]	12	68	81	13	69	87	14	13	30	10	9	26
g / C, Green / Cycle	0.10	0.56	0.68	0.11	0.57	0.73	0.12	0.11	0.25	0.08	0.07	0.22
(v / s)_i Volume / Saturation Flow Rate	0.09	0.22	0.14	0.09	0.23	0.09	0.10	0.06	0.05	0.06	0.04	0.15
s, saturation flow rate [veh/h]	2912	4826	1506	2912	4826	1506	1593	3373	1506	1593	3373	1506
c, Capacity [veh/h]	296	2715	1020	324	2761	1092	190	377	372	129	248	328
d1, Uniform Delay [s]	52.96	14.71	7.32	52.34	14.21	5.00	51.85	50.14	35.72	54.11	53.68	43.27
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	6.24	0.42	0.48	5.98	0.43	0.24	10.48	1.01	0.24	9.76	1.86	2.65
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.84	0.39	0.21	0.84	0.40	0.13	0.86	0.50	0.19	0.78	0.54	0.69
d, Delay for Lane Group [s/veh]	59.20	15.13	7.79	58.32	14.63	5.23	62.32	51.15	35.96	63.87	55.54	45.92
Lane Group LOS	E	B	A	E	B	A	E	D	D	E	E	D
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	3.93	5.39	2.14	4.30	5.46	1.02	5.36	2.70	1.66	3.34	2.03	6.48
50th-Percentile Queue Length [ft/ln]	98.17	134.6	53.57	107.5	136.6	25.46	134.0	67.45	41.43	83.62	50.83	161.9
95th-Percentile Queue Length [veh/ln]	7.07	9.19	3.86	7.70	9.30	1.83	9.16	4.86	2.98	6.02	3.66	10.65
95th-Percentile Queue Length [ft/ln]	176.7	229.8	96.42	192.5	232.4	45.83	229.0	121.4	74.57	150.5	91.50	266.2

Movement, Approach, & Intersection Results

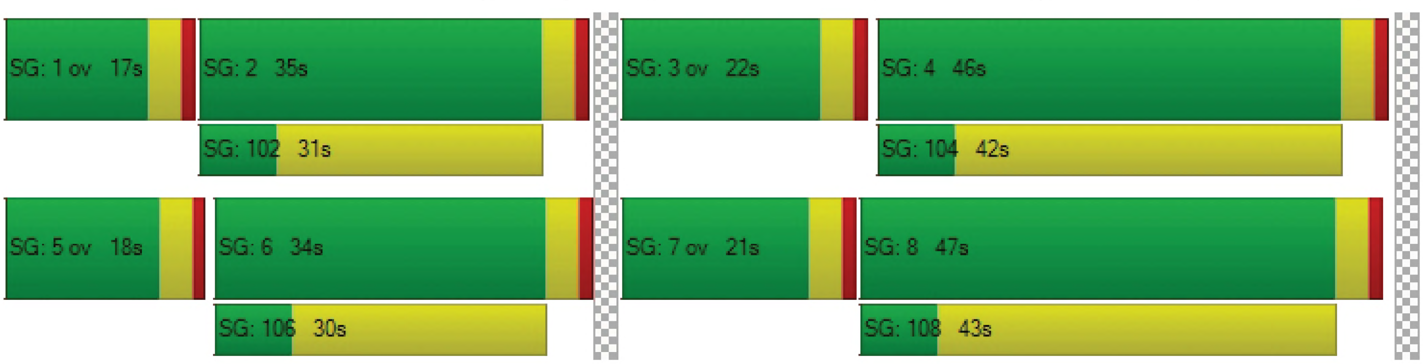
d_M, Delay for Movement [s/veh]	59.20	15.13	7.79	58.32	14.63	5.23	62.32	51.15	35.96	63.87	55.54	45.92
Movement LOS	E	B	A	E	B	A	E	D	D	E	E	D
d_A, Approach Delay [s/veh]	21.25			21.71			52.96			52.63		
Approach LOS	C			C			D			D		
d_I, Intersection Delay [s/veh]	28.55											
Intersection LOS	C											
Intersection V/C	0.603											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.52	49.52	49.52	49.52
I_p,int, Pedestrian LOS Score for Intersection	3.165	3.183	2.619	2.652
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	500	517	716	700
d_b, Bicycle Delay [s]	33.76	33.02	24.72	25.36
I_b,int, Bicycle LOS Score for Intersection	2.398	2.386	1.906	1.942
Bicycle LOS	B	B	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Tippecanoe Avenue at Orange Show Rd/San Bernardino Ave

Control Type:	Signalized	Delay (sec / veh):	33.2
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.825

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Orange Show Rd			San Bernardino Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Orange Show Rd			San Bernardino Ave		
Base Volume Input [veh/h]	102	1020	101	179	884	130	203	312	134	98	243	174
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	102	1020	101	179	884	130	203	312	134	98	243	174
Peak Hour Factor	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	29	289	29	51	251	37	58	89	38	28	69	49
Total Analysis Volume [veh/h]	116	1158	115	203	1003	148	230	354	152	111	276	198
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Permi	Protec	Permi	Permi	ProtP	Permi	Permi	ProtP	Permi	Permi
Signal Group	1	6	0	5	2	0	3	8	0	7	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	8	0	5	8	0	5	8	0	5	8	0
Maximum Green [s]	30	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	13	35	0	13	35	0	13	42	0	10	39	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	22	0	0	24	0	0	24	0	0	24	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
l2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	No		No	No		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	L	C	C
C, Cycle Length [s]	100	100	100	100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00
g_i, Effective Green Time [s]	9	46	46	9	46	46	33	23	23	33	20	20
g / C, Green / Cycle	0.09	0.46	0.46	0.09	0.46	0.46	0.33	0.23	0.23	0.33	0.20	0.20
(v / s)_i Volume / Saturation Flow Rate	0.07	0.36	0.37	0.07	0.33	0.33	0.20	0.15	0.15	0.10	0.14	0.15
s, saturation flow rate [veh/h]	1593	1772	1716	2912	1772	1693	1145	1772	1594	1063	1772	1531
c, Capacity [veh/h]	141	817	791	258	817	781	351	407	366	327	354	306
d1, Uniform Delay [s]	44.84	22.84	22.91	44.68	21.71	21.78	27.87	34.91	34.94	25.29	37.33	37.46
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.21	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	11.23	7.63	8.05	5.27	5.37	5.74	3.95	1.77	2.00	0.61	2.64	3.28
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.82	0.79	0.79	0.79	0.72	0.72	0.65	0.65	0.66	0.34	0.71	0.73
d, Delay for Lane Group [s/veh]	56.07	30.47	30.96	49.95	27.08	27.52	31.82	36.68	36.94	25.90	39.97	40.75
Lane Group LOS	E	C	C	D	C	C	C	D	D	C	D	D
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	3.25	14.00	13.76	2.64	11.83	11.49	4.61	5.98	5.44	1.93	5.93	5.30
50th-Percentile Queue Length [ft/ln]	81.22	349.9	344.0	65.96	295.6	287.1	115.2	149.4	135.9	48.23	148.2	132.6
95th-Percentile Queue Length [veh/ln]	5.85	20.14	19.84	4.75	17.47	17.05	8.13	9.99	9.26	3.47	9.92	9.08
95th-Percentile Queue Length [ft/ln]	146.1	503.3	496.1	118.7	436.6	426.1	203.2	249.7	231.5	86.82	248.0	227.0

Movement, Approach, & Intersection Results

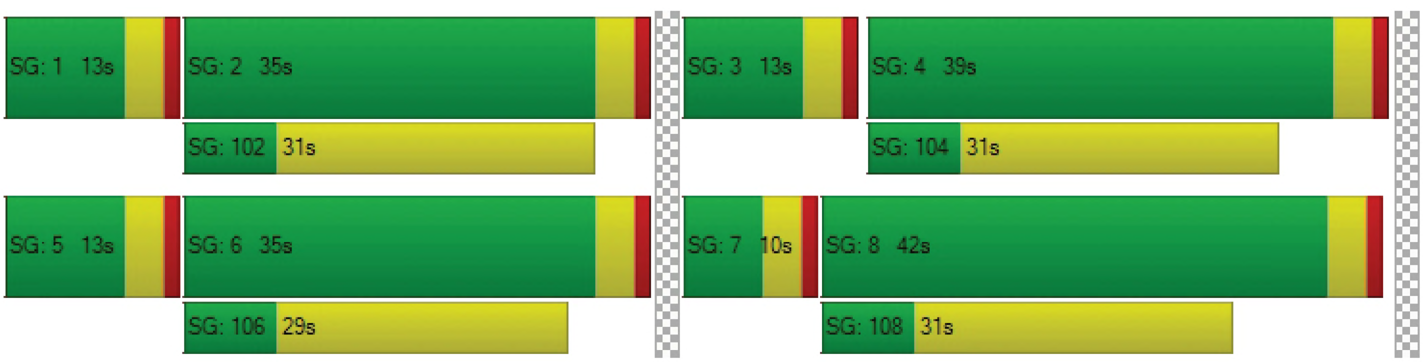
d_M, Delay for Movement [s/veh]	56.07	30.69	30.96	49.95	27.26	27.52	31.82	36.74	36.94	25.90	40.04	40.75
Movement LOS	E	C	C	D	C	C	C	D	D	C	D	D
d_A, Approach Delay [s/veh]	32.83			30.69			35.25			37.59		
Approach LOS	C			C			D			D		
d_I, Intersection Delay [s/veh]	33.24											
Intersection LOS	C											
Intersection V/C	0.825											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	39.62	39.62	39.62	39.62
I_p,int, Pedestrian LOS Score for Intersection	2.862	3.008	2.554	2.550
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	620	620	760	700
d_b, Bicycle Delay [s]	23.82	23.82	19.24	21.14
I_b,int, Bicycle LOS Score for Intersection	2.706	2.677	2.167	2.042
Bicycle LOS	B	B	B	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Tippecanoe Avenue at Harriman Place/I-10 WB Ramps

Control Type:	Signalized	Delay (sec / veh):	29.2
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.606

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Harriman Pl			I-10 WB Ramps		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Harriman Pl			I-10 WB Ramps		
Base Volume Input [veh/h]	200	878	414	0	934	80	62	0	245	588	177	412
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	200	878	414	0	934	80	62	0	245	588	177	412
Peak Hour Factor	0.962	0.962	0.962	1.000	0.962	0.962	0.962	1.000	0.962	0.962	0.962	0.962
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	52	228	108	0	243	21	16	0	64	153	46	107
Total Analysis Volume [veh/h]	208	913	430	0	971	83	64	0	255	611	184	428
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]		0			0			0			0	
v_di, Inbound Pedestrian Volume crossing major street [ped/h]		0			0			0			0	
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]		0			0			0			0	
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]		0			0			0			0	
v_ab, Corner Pedestrian Volume [ped/h]		0			0			0			0	
Bicycle Volume [bicycles/h]		0			0			0			0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	115
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Protec	Permi	Unsig	Permi	Permi	Permi	Split	Permi	Overla	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	0	3	7	4	0
Auxiliary Signal Groups									1,3			
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	8	8	0	0	8	0	8	0	8	6	8	0
Maximum Green [s]	30	30	0	0	30	0	30	0	30	30	30	0
Amber [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0
Split [s]	14	49	0	0	35	0	12	0	12	10	54	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	21	0	0	24	0	0	0	0	0	39	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0
Minimum Recall	No	No			No		No		No		No	
Maximum Recall	No	No			No		No		No		No	
Pedestrian Recall	No	No			No		No		No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	C	L	R	L	C	R
C, Cycle Length [s]	115	115	115	115	115	115	115	115	115
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	10	66	52	52	8	55	29	29	29
g / C, Green / Cycle	0.09	0.57	0.45	0.45	0.07	0.48	0.25	0.25	0.25
(v / s)_i Volume / Saturation Flow Rate	0.07	0.19	0.16	0.16	0.04	0.10	0.22	0.18	0.20
s, saturation flow rate [veh/h]	2912	4826	4826	1678	1593	2665	2752	1655	1506
c, Capacity [veh/h]	254	2768	2179	758	111	1277	707	417	380
d1, Uniform Delay [s]	51.60	12.90	20.69	20.53	51.84	17.27	41.43	39.46	40.37
k, delay calibration	0.11	0.50	0.50	0.50	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	6.39	0.32	0.47	1.26	4.60	0.08	3.31	2.51	4.06
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.82	0.33	0.36	0.35	0.57	0.20	0.86	0.73	0.81
d, Delay for Lane Group [s/veh]	58.00	13.22	21.16	21.79	56.44	17.35	44.74	41.96	44.42
Lane Group LOS	E	B	C	C	E	B	D	D	D
Critical Lane Group	Yes	No	Yes	No	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	3.17	4.11	4.70	4.84	1.93	1.96	8.59	8.18	8.50
50th-Percentile Queue Length [ft/ln]	79.23	102.75	117.59	120.93	48.30	48.90	214.6	204.4	212.4
95th-Percentile Queue Length [veh/ln]	5.70	7.40	8.26	8.44	3.48	3.52	13.39	12.87	13.28
95th-Percentile Queue Length [ft/ln]	142.62	184.95	206.51	211.10	86.94	88.02	334.8	321.7	331.9

Movement, Approach, & Intersection Results

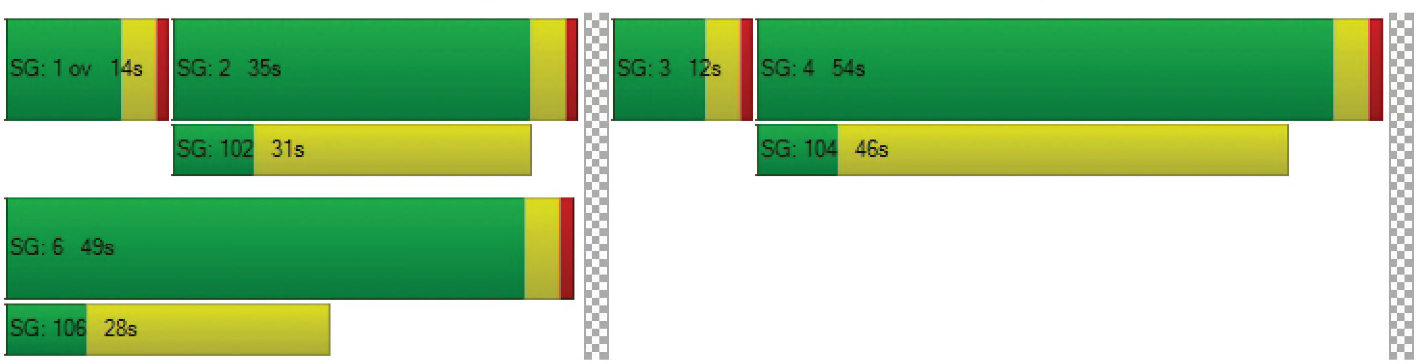
d_M, Delay for Movement [s/veh]	58.00	13.22	0.00	0.00	21.28	21.79	56.44	0.00	17.35	44.74	41.96	43.72
Movement LOS	E	B			C	C	E		B	D	D	D
d_A, Approach Delay [s/veh]	21.53			21.32			25.19			43.97		
Approach LOS	C			C			C			D		
d_I, Intersection Delay [s/veh]	29.17											
Intersection LOS	C											
Intersection V/C	0.606											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	47.04	47.04	47.04
I_p,int, Pedestrian LOS Score for Intersection	0.000	2.948	2.466	2.550
Crosswalk LOS	F	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	782	539	139	869
d_b, Bicycle Delay [s]	21.31	30.69	49.79	18.38
I_b,int, Bicycle LOS Score for Intersection	2.176	1.994	1.560	3.578
Bicycle LOS	B	A	A	D

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Tippecanoe Avenue/Anderson Street at I-10 EB Ramps

Control Type:	Signalized	Delay (sec / veh):	24.0
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.732

Intersection Setup

Name	Tippecanoe Ave			Anderson St			I-10 EB Ramps			I-10 EB Ramps		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No					
Crosswalk	No			No			No			Yes		

Volumes

Name	Tippecanoe Ave			Anderson St			I-10 EB Ramps			I-10 EB Ramps		
Base Volume Input [veh/h]	0	786	323	254	958	0	706	3	727	0	0	0
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	786	323	254	958	0	706	3	727	0	0	0
Peak Hour Factor	1.000	0.935	0.935	0.935	0.935	1.000	0.935	0.935	0.935	1.000	1.000	1.000
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	0	210	86	68	256	0	189	1	194	0	0	0
Total Analysis Volume [veh/h]	0	841	345	272	1025	0	755	3	778	0	0	0
Presence of On-Street Parking	No		No	No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permi	Permi	Permi	Protec	Permi	Permi	Split	Split	Split	Permi	Permi	Permi
Signal Group	0	6	0	5	2	0	0	8	0	0	0	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	0	8	0	8	8	0	0	8	0	0	0	0
Maximum Green [s]	0	30	0	30	30	0	0	30	0	0	0	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
Split [s]	0	29	0	14	43	0	0	47	0	0	0	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Walk [s]	0	7	0	0	0	0	0	0	0	0	0	0
Pedestrian Clearance [s]	0	14	0	0	0	0	0	0	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No				
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Minimum Recall		No		No	No			No				
Maximum Recall		No		No	No			No				
Pedestrian Recall		No		No	No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	R	L	C	L	C	R	
C, Cycle Length [s]	90	90	90	90	90	90	90	
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]	37	37	10	51	31	31	31	
g / C, Green / Cycle	0.41	0.41	0.11	0.57	0.34	0.34	0.34	
(v / s)_i Volume / Saturation Flow Rate	0.25	0.23	0.09	0.30	0.24	0.24	0.29	
s, saturation flow rate [veh/h]	3373	1506	2912	3373	1593	1594	2665	
c, Capacity [veh/h]	1385	618	326	1913	548	549	917	
d1, Uniform Delay [s]	20.83	20.28	39.17	12.13	25.41	25.41	27.35	
k, delay calibration	0.50	0.50	0.11	0.50	0.11	0.11	0.11	
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]	1.99	3.61	5.60	1.08	1.57	1.57	2.29	
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity	0.61	0.56	0.83	0.54	0.69	0.69	0.85	
d, Delay for Lane Group [s/veh]	22.82	23.89	44.77	13.21	26.98	26.97	29.64	
Lane Group LOS	C	C	D	B	C	C	C	
Critical Lane Group	Yes	No	Yes	No	No	No	Yes	
50th-Percentile Queue Length [veh/ln]	7.01	5.92	3.15	6.13	6.96	6.96	7.72	
50th-Percentile Queue Length [ft/ln]	175.35	147.96	78.84	153.32	174.0	174.0	192.9	
95th-Percentile Queue Length [veh/ln]	11.36	9.91	5.68	10.19	11.29	11.29	12.28	
95th-Percentile Queue Length [ft/ln]	283.94	247.70	141.91	254.86	282.2	282.2	306.9	

Movement, Approach, & Intersection Results

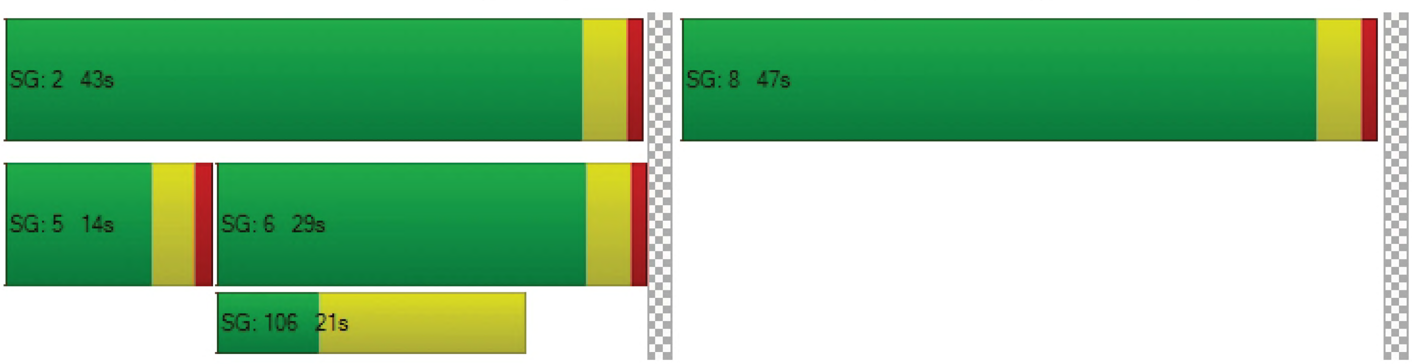
d_M, Delay for Movement [s/veh]	0.00	22.82	23.89	44.77	13.21	0.00	26.98	26.97	29.64	0.00	0.00	0.00
Movement LOS		C	C	D	B		C	C	C			
d_A, Approach Delay [s/veh]	23.13			19.83			28.33			0.00		
Approach LOS	C			B			C			A		
d_I, Intersection Delay [s/veh]	24.05											
Intersection LOS	C											
Intersection V/C	0.732											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	34.68
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	2.017
Crosswalk LOS	F	F	F	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	555	866	955	0
d_b, Bicycle Delay [s]	23.48	14.46	12.28	45.01
I_b,int, Bicycle LOS Score for Intersection	2.538	2.630	4.094	4.132
Bicycle LOS	B	B	D	D

Sequence

Ring 1	-	2	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 1: Tippecanoe Avenue at Mill Street

Control Type:	Signalized	Delay (sec / veh):	20.0
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.580

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Mill Street			Mill Street		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			No			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Mill Street			Mill Street		
Base Volume Input [veh/h]	128	1369	0	1	1028	219	268	15	306	8	12	4
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	128	1369	0	1	1028	219	268	15	306	8	12	4
Peak Hour Factor	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	36	385	0	0	289	62	75	4	86	2	3	1
Total Analysis Volume [veh/h]	144	1540	0	1	1156	246	301	17	344	9	13	4
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Permi	Protec	Permi	Overla	Split	Split	Overla	Split	Split	Split
Signal Group	1	6	0	5	2	2	0	8	8	0	4	0
Auxiliary Signal Groups						2,8			1,8			
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	5	8	0	5	8	8	0	8	8	0	8	0
Maximum Green [s]	30	30	0	30	30	30	0	30	30	0	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	0.0
Split [s]	22	52	0	9	39	39	0	47	47	0	12	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	7	0	7	7	0	0	0
Pedestrian Clearance [s]	0	41	0	0	24	24	0	36	36	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	0.0
Minimum Recall	No	No		No	No	No		No	No		No	
Maximum Recall	No	No		No	No	No		No	No		No	
Pedestrian Recall	No	No		No	No	No		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	R	L	C	R	L	C	R
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	18	83	83	0	65	94	16	16	38	5	5	5
g / C, Green / Cycle	0.15	0.69	0.69	0.00	0.54	0.78	0.13	0.13	0.32	0.04	0.04	0.04
(v / s)_i Volume / Saturation Flow Rate	0.09	0.30	0.30	0.00	0.24	0.16	0.10	0.10	0.23	0.01	0.00	0.00
s, saturation flow rate [veh/h]	1593	3373	1772	1593	4826	1506	1593	1602	1506	1593	3373	1506
c, Capacity [veh/h]	239	2334	1226	3	2623	1179	213	214	478	62	132	59
d1, Uniform Delay [s]	47.65	8.13	8.13	59.83	16.44	3.37	50.00	50.00	36.25	55.73	55.63	55.56
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.39	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.42	0.59	1.11	56.60	0.54	0.40	5.07	5.03	7.11	1.05	0.32	0.48
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.60	0.43	0.43	0.34	0.44	0.21	0.74	0.74	0.72	0.14	0.10	0.07
d, Delay for Lane Group [s/veh]	50.08	8.72	9.25	116.4	16.98	3.77	55.07	55.03	43.36	56.78	55.95	56.04
Lane Group LOS	D	A	A	F	B	A	E	E	D	E	E	E
Critical Lane Group	Yes	No	No	No	Yes	No	No	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	4.19	5.50	5.96	0.08	6.37	1.41	4.88	4.90	9.81	0.28	0.20	0.12
50th-Percentile Queue Length [ft/ln]	104.7	137.5	148.9	1.92	159.3	35.20	122.0	122.4	245.1	7.05	4.90	3.12
95th-Percentile Queue Length [veh/ln]	7.54	9.35	9.96	0.14	10.51	2.53	8.50	8.53	14.94	0.51	0.35	0.22
95th-Percentile Queue Length [ft/ln]	188.5	233.6	249.0	3.46	262.8	63.37	212.5	213.2	373.5	12.69	8.83	5.62

Movement, Approach, & Intersection Results

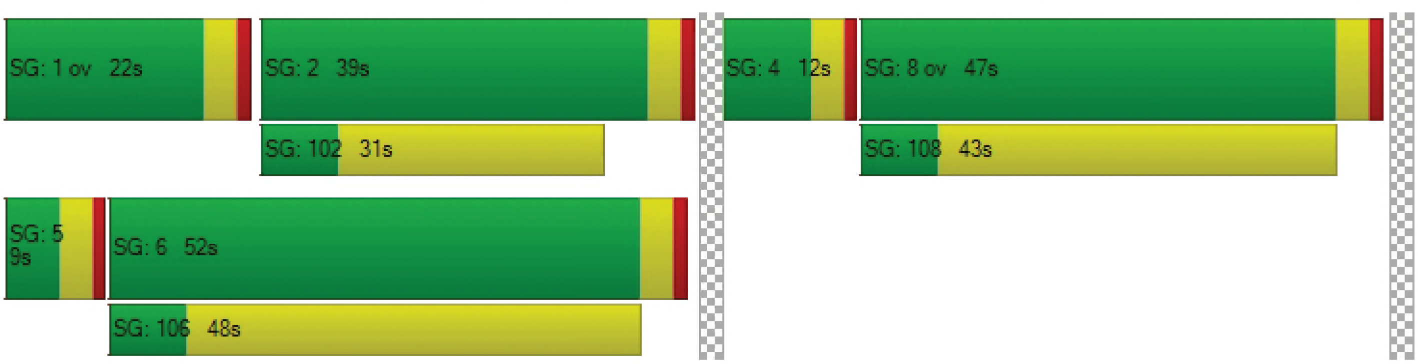
d_M, Delay for Movement [s/veh]	50.08	8.90	9.25	116.4	16.98	3.77	55.05	55.03	43.36	56.78	55.95	56.04
Movement LOS	D	A	A	F	B	A	E	E	D	E	E	E
d_A, Approach Delay [s/veh]	12.42			14.73			48.98			56.25		
Approach LOS	B			B			D			E		
d_I, Intersection Delay [s/veh]	19.99											
Intersection LOS	B											
Intersection V/C	0.580											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.51	0.00	49.51	49.51
I_p,int, Pedestrian LOS Score for Intersection	3.052	0.000	2.521	2.322
Crosswalk LOS	C	F	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	800	583	717	133
d_b, Bicycle Delay [s]	21.61	30.11	24.71	52.27
I_b,int, Bicycle LOS Score for Intersection	2.486	2.331	2.652	1.581
Bicycle LOS	B	B	B	A

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Tippecanoe Avenue at Central Avenue

Control Type:	Signalized	Delay (sec / veh):	31.6
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.658

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Central Avenue			Central Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Central Avenue			Central Avenue		
Base Volume Input [veh/h]	269	991	89	211	1123	128	235	121	84	125	170	211
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	269	991	89	211	1123	128	235	121	84	125	170	211
Peak Hour Factor	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	70	258	23	55	292	33	61	31	22	32	44	55
Total Analysis Volume [veh/h]	280	1030	93	219	1167	133	244	126	87	130	177	219
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Overla	Protec	Permi	Overla	Protec	Permi	Overla	Protec	Permi	Overla
Signal Group	1	6	6	5	2	2	3	8	8	7	4	4
Auxiliary Signal Groups			6,7			2,3			1,8			4,5
Lead / Lag	Lead	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	8	8	5	8	8	5	8	8	5	8	8
Maximum Green [s]	30	30	30	30	30	30	30	30	30	30	30	30
Amber [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Split [s]	16	34	34	17	35	35	23	47	47	22	46	46
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Walk [s]	0	7	7	0	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	0	23	23	0	24	24	0	36	36	0	35	35
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Recall	No	No	No	No	No	No	No	No	No	No	No	No
Maximum Recall	No	No	No	No	No	No	No	No	No	No	No	No
Pedestrian Recall	No	No	No	No	No	No	No	No	No	No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	R	L	C	R
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	2.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00
g_i, Effective Green Time [s]	12	63	96	13	64	87	19	16	32	12	9	49
g / C, Green / Cycle	0.10	0.52	0.80	0.11	0.53	0.72	0.16	0.14	0.27	0.10	0.08	0.41
(v / s)_i Volume / Saturation Flow Rate	0.10	0.21	0.06	0.08	0.24	0.09	0.17	0.04	0.06	0.08	0.05	0.15
s, saturation flow rate [veh/h]	2912	4826	1506	2752	4826	1506	1417	3373	1506	1593	3373	1506
c, Capacity [veh/h]	293	2531	1199	311	2564	1089	263	462	408	156	258	616
d1, Uniform Delay [s]	53.73	17.26	2.65	53.85	17.40	5.05	52.90	46.45	33.88	53.17	54.05	24.54
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.22	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	16.01	0.49	0.13	2.90	0.59	0.23	23.14	0.32	0.26	10.77	3.24	0.35
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.96	0.41	0.08	0.70	0.46	0.12	0.93	0.27	0.21	0.83	0.69	0.36
d, Delay for Lane Group [s/veh]	69.75	17.75	2.78	56.75	17.99	5.28	76.04	46.77	34.14	63.94	57.29	24.89
Lane Group LOS	E	B	A	E	B	A	E	D	C	E	E	C
Critical Lane Group	No	Yes	No	No	No	No	Yes	No	No	No	Yes	Yes
50th-Percentile Queue Length [veh/ln]	4.85	5.78	0.43	3.38	6.67	0.99	9.12	1.72	2.01	4.32	2.72	4.37
50th-Percentile Queue Length [ft/ln]	121.2	144.4	10.69	84.61	166.6	24.82	228.0	42.89	50.25	107.9	68.09	109.2
95th-Percentile Queue Length [veh/ln]	8.46	9.72	0.77	6.09	10.90	1.79	14.07	3.09	3.62	7.72	4.90	7.80
95th-Percentile Queue Length [ft/ln]	211.5	243.0	19.25	152.3	272.5	44.68	351.8	77.20	90.44	193.0	122.5	194.9

Movement, Approach, & Intersection Results

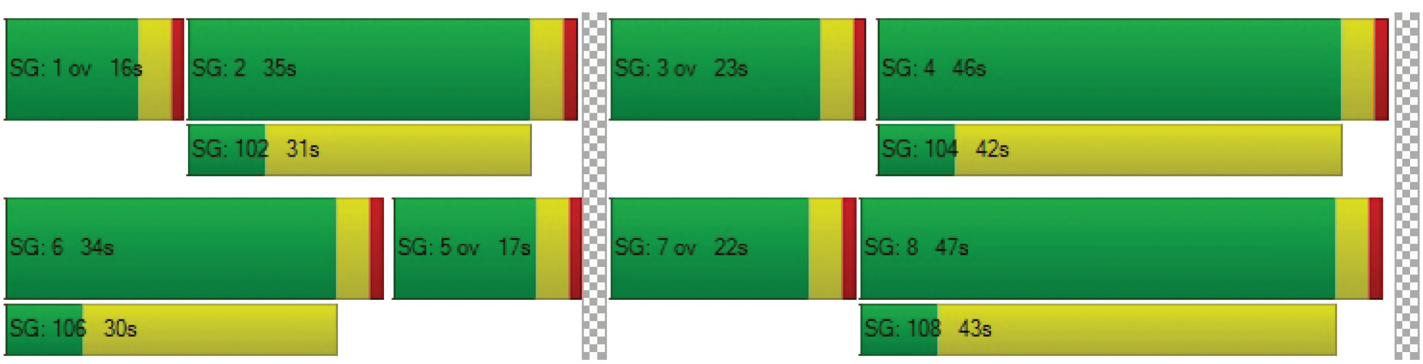
d_M, Delay for Movement [s/veh]	69.75	17.75	2.78	56.75	17.99	5.28	76.04	46.77	34.14	63.94	57.29	24.89
Movement LOS	E	B	A	E	B	A	E	D	C	E	E	C
d_A, Approach Delay [s/veh]	27.13			22.46			59.99			45.45		
Approach LOS	C			C			E			D		
d_I, Intersection Delay [s/veh]	31.63											
Intersection LOS	C											
Intersection V/C	0.658											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.52	49.52	49.52	49.52
I_p,int, Pedestrian LOS Score for Intersection	3.165	3.536	2.637	2.935
Crosswalk LOS	C	D	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	500	517	716	700
d_b, Bicycle Delay [s]	33.76	33.02	24.72	25.36
I_b,int, Bicycle LOS Score for Intersection	2.331	2.395	1.937	1.994
Bicycle LOS	B	B	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Tippecanoe Avenue at Orange Show Rd/San Bernardino Ave

Control Type:	Signalized	Delay (sec / veh):	44.7
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.889

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Orange Show Rd			San Bernardino Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Orange Show Rd			San Bernardino Ave		
Base Volume Input [veh/h]	113	1070	110	269	1028	165	224	449	141	73	356	233
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	113	1070	110	269	1028	165	224	449	141	73	356	233
Peak Hour Factor	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	30	288	30	72	277	44	60	121	38	20	96	63
Total Analysis Volume [veh/h]	122	1153	119	290	1108	178	241	484	152	79	384	251
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Permi	Protec	Permi	Permi	ProtP	Permi	Permi	ProtP	Permi	Permi
Signal Group	1	6	0	5	2	0	3	8	0	7	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	8	0	5	8	0	5	8	0	5	8	0
Maximum Green [s]	30	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	15	47	0	18	50	0	15	45	0	10	40	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	22	0	0	24	0	0	24	0	0	24	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	No		No	No		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	L	C	C
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00
g_i, Effective Green Time [s]	11	50	50	14	53	53	44	34	34	44	29	29
g / C, Green / Cycle	0.09	0.42	0.42	0.11	0.44	0.44	0.37	0.29	0.29	0.37	0.24	0.24
(v / s)_i Volume / Saturation Flow Rate	0.08	0.36	0.37	0.10	0.37	0.38	0.23	0.19	0.19	0.08	0.19	0.19
s, saturation flow rate [veh/h]	1593	1772	1714	2912	1772	1688	1029	1772	1628	929	1772	1542
c, Capacity [veh/h]	144	742	718	334	785	748	319	508	467	296	427	372
d1, Uniform Delay [s]	53.75	31.84	31.95	52.22	29.45	29.77	32.05	37.55	37.56	27.18	42.69	42.78
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.40	0.12	0.12	0.11	0.19	0.19
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	12.55	13.10	13.92	6.84	9.97	11.39	12.63	1.59	1.74	0.48	5.67	6.87
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.85	0.87	0.87	0.87	0.83	0.85	0.76	0.65	0.65	0.27	0.79	0.80
d, Delay for Lane Group [s/veh]	66.29	44.93	45.87	59.06	39.42	41.16	44.68	39.15	39.30	27.66	48.36	49.66
Lane Group LOS	E	D	D	E	D	D	D	D	D	C	D	D
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	4.13	19.43	19.12	4.60	18.40	18.28	6.29	8.73	8.05	1.55	10.02	8.94
50th-Percentile Queue Length [ft/ln]	103.1	485.6	477.9	115.1	459.9	457.0	157.2	218.1	201.2	38.83	250.6	223.5
95th-Percentile Queue Length [veh/ln]	7.43	26.65	26.29	8.12	25.43	25.29	10.41	13.57	12.70	2.80	15.22	13.85
95th-Percentile Queue Length [ft/ln]	185.7	666.3	657.1	203.1	635.8	632.3	260.1	339.3	317.5	69.90	380.4	346.1

Movement, Approach, & Intersection Results

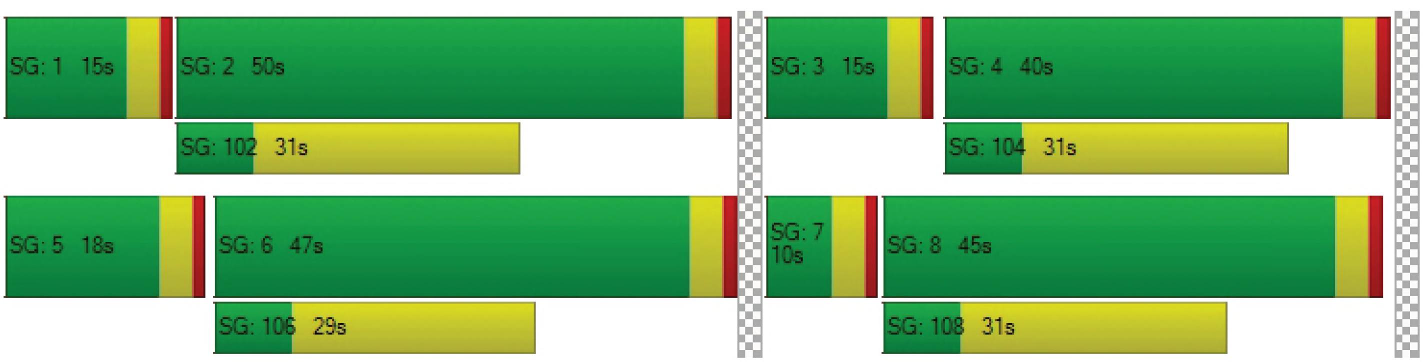
d_M, Delay for Movement [s/veh]	66.29	45.34	45.87	59.06	40.13	41.16	44.68	39.19	39.30	27.66	48.51	49.66
Movement LOS	E	D	D	E	D	D	D	D	D	C	D	D
d_A, Approach Delay [s/veh]		47.22			43.73			40.72			46.61	
Approach LOS		D			D			D			D	
d_I, Intersection Delay [s/veh]	44.67											
Intersection LOS	D											
Intersection V/C	0.889											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.50	49.50	49.50	49.50
I_p,int, Pedestrian LOS Score for Intersection	2.881	3.079	2.618	2.627
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	717	767	683	600
d_b, Bicycle Delay [s]	24.70	22.82	26.00	29.40
I_b,int, Bicycle LOS Score for Intersection	2.710	2.860	2.283	2.149
Bicycle LOS	B	C	B	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Tippecanoe Avenue at Harriman Place/I-10 WB Ramps

Control Type:	Signalized	Delay (sec / veh):	40.2
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.963

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Harriman Pl			I-10 WB Ramps		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Harriman Pl			I-10 WB Ramps		
Base Volume Input [veh/h]	361	799	648	0	1371	203	175	0	685	241	272	423
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	361	799	648	0	1371	203	175	0	685	241	272	423
Peak Hour Factor	0.949	0.949	0.949	1.000	0.949	0.949	0.949	1.000	0.949	0.949	0.949	0.949
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	95	210	171	0	361	53	46	0	180	63	72	111
Total Analysis Volume [veh/h]	380	842	683	0	1445	214	184	0	722	254	287	446
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Protec	Permi	Unsig	Permi	Permi	Permi	Split	Permi	Overla	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	0	3	7	4	0
Auxiliary Signal Groups									1,3			
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	8	8	0	0	8	0	8	0	8	6	8	0
Maximum Green [s]	30	30	0	0	30	0	30	0	30	30	30	0
Amber [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0
Split [s]	18	53	0	0	35	0	17	0	17	10	50	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	21	0	0	24	0	0	0	0	0	39	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0
Minimum Recall	No	No			No		No		No		No	
Maximum Recall	No	No			No		No		No		No	
Pedestrian Recall	No	No			No		No		No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	C	L	R	L	C	R
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	14	63	45	45	13	67	32	32	32
g / C, Green / Cycle	0.12	0.52	0.37	0.37	0.11	0.56	0.27	0.27	0.27
(v / s)_i Volume / Saturation Flow Rate	0.13	0.17	0.26	0.26	0.12	0.27	0.09	0.21	0.24
s, saturation flow rate [veh/h]	2912	4826	4826	1624	1593	2665	2752	1706	1506
c, Capacity [veh/h]	341	2517	1791	603	173	1498	753	460	406
d1, Uniform Delay [s]	53.00	16.64	31.98	31.88	53.50	15.79	35.36	40.79	42.33
k, delay calibration	0.11	0.50	0.50	0.50	0.11	0.11	0.11	0.14	0.19
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	60.69	0.36	2.25	6.30	49.22	0.26	0.26	4.07	12.49
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.11	0.33	0.69	0.69	1.06	0.48	0.34	0.80	0.90
d, Delay for Lane Group [s/veh]	113.69	17.00	34.23	38.18	102.72	16.04	35.62	44.86	54.82
Lane Group LOS	F	B	C	D	F	B	D	D	D
Critical Lane Group	Yes	No	Yes	No	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	8.01	4.52	10.47	11.12	7.59	5.86	3.04	10.54	11.81
50th-Percentile Queue Length [ft/ln]	200.17	113.04	261.66	277.91	189.83	146.58	75.90	263.5	295.2
95th-Percentile Queue Length [veh/ln]	13.19	8.01	15.77	16.58	12.40	9.83	5.46	15.87	17.45
95th-Percentile Queue Length [ft/ln]	329.76	200.22	394.30	414.61	309.89	245.85	136.6	396.7	436.1

Movement, Approach, & Intersection Results

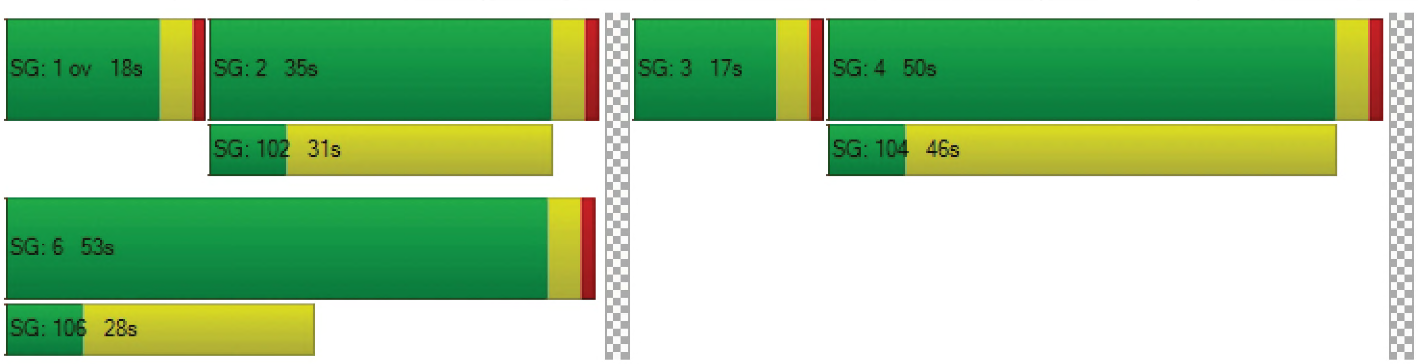
d_M, Delay for Movement [s/veh]	113.6	17.00	0.00	0.00	34.78	38.18	102.7	0.00	16.04	35.62	44.86	53.05
Movement LOS	F	B			C	D	F		B	D	D	D
d_A, Approach Delay [s/veh]	47.07			35.21			33.64			46.18		
Approach LOS	D			D			C			D		
d_I, Intersection Delay [s/veh]	40.22											
Intersection LOS	D											
Intersection V/C	0.963											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	49.52	49.52	49.52
I_p,int, Pedestrian LOS Score for Intersection	0.000	3.044	2.662	2.506
Crosswalk LOS	F	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	816	517	217	766
d_b, Bicycle Delay [s]	21.02	33.02	47.72	22.83
I_b,int, Bicycle LOS Score for Intersection	2.232	2.244	1.560	3.188
Bicycle LOS	B	B	A	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Tippecanoe Avenue/Anderson Street at I-10 EB Ramps

Control Type:	Signalized	Delay (sec / veh):	35.8
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.901

Intersection Setup

Name	Tippecanoe Ave			Anderson St			I-10 EB Ramps			I-10 EB Ramps		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No					
Crosswalk	No			No			No			Yes		

Volumes

Name	Tippecanoe Ave			Anderson St			I-10 EB Ramps			I-10 EB Ramps		
Base Volume Input [veh/h]	0	1310	378	732	907	0	480	3	336	0	0	0
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	1310	378	732	907	0	480	3	336	0	0	0
Peak Hour Factor	1.000	0.976	0.976	0.976	0.976	1.000	0.976	0.976	0.976	1.000	1.000	1.000
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	0	336	97	188	232	0	123	1	86	0	0	0
Total Analysis Volume [veh/h]	0	1342	387	750	929	0	492	3	344	0	0	0
Presence of On-Street Parking	No		No	No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permi	Permi	Permi	Protec	Permi	Permi	Split	Split	Split	Permi	Permi	Permi
Signal Group	0	6	0	5	2	0	0	8	0	0	0	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	0	8	0	8	8	0	0	8	0	0	0	0
Maximum Green [s]	0	30	0	30	30	0	0	30	0	0	0	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
Split [s]	0	25	0	69	94	0	0	26	0	0	0	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Walk [s]	0	7	0	0	0	0	0	0	0	0	0	0
Pedestrian Clearance [s]	0	14	0	0	0	0	0	0	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No				
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Minimum Recall		No		No	No			No				
Maximum Recall		No		No	No			No				
Pedestrian Recall		No		No	No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	R	L	C	L	C	R	
C, Cycle Length [s]	120	120	120	120	120	120	120	
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]	53	53	34	91	21	21	21	
g / C, Green / Cycle	0.44	0.44	0.28	0.76	0.17	0.17	0.17	
(v / s)_i Volume / Saturation Flow Rate	0.40	0.26	0.26	0.28	0.16	0.16	0.13	
s, saturation flow rate [veh/h]	3373	1506	2912	3373	1593	1594	2665	
c, Capacity [veh/h]	1492	666	829	2565	276	276	461	
d1, Uniform Delay [s]	30.96	25.09	41.34	4.76	48.55	48.55	47.09	
k, delay calibration	0.50	0.50	0.11	0.50	0.17	0.17	0.11	
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]	8.99	3.67	4.08	0.40	14.92	14.87	2.43	
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity	0.90	0.58	0.90	0.36	0.90	0.90	0.75	
d, Delay for Lane Group [s/veh]	39.96	28.77	45.42	5.15	63.47	63.42	49.52	
Lane Group LOS	D	C	D	A	E	E	D	
Critical Lane Group	Yes	No	Yes	No	Yes	No	No	
50th-Percentile Queue Length [veh/ln]	19.37	8.86	11.05	3.41	8.37	8.37	5.03	
50th-Percentile Queue Length [ft/ln]	484.15	221.52	276.26	85.36	209.2	209.2	125.7	
95th-Percentile Queue Length [veh/ln]	26.58	13.74	16.50	6.15	13.11	13.11	8.71	
95th-Percentile Queue Length [ft/ln]	664.58	343.56	412.55	153.65	327.8	327.8	217.6	

Movement, Approach, & Intersection Results

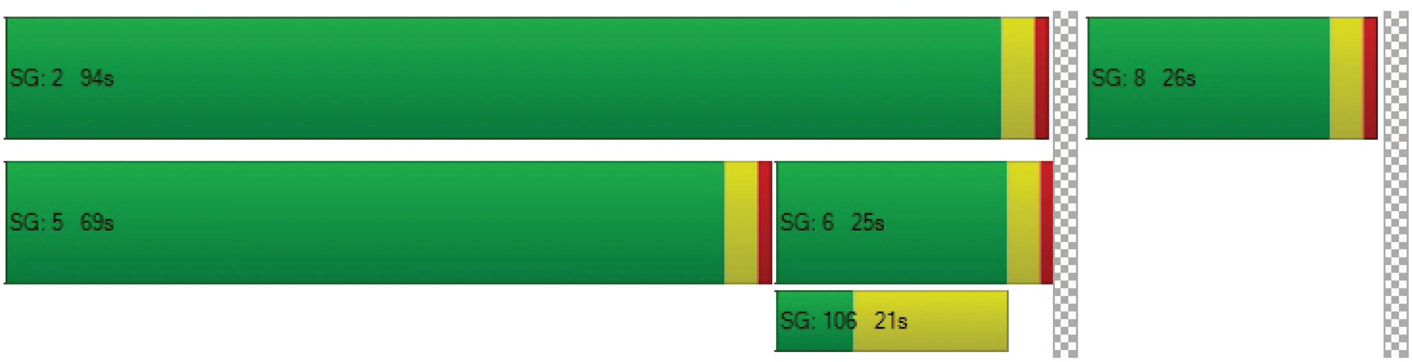
d_M, Delay for Movement [s/veh]	0.00	39.96	28.77	45.42	5.15	0.00	63.44	63.42	49.52	0.00	0.00	0.00
Movement LOS		D	C	D	A		E	E	D			
d_A, Approach Delay [s/veh]	37.45			23.14			57.73			0.00		
Approach LOS	D			C			E			A		
d_I, Intersection Delay [s/veh]	35.80											
Intersection LOS	D											
Intersection V/C	0.901											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	49.49
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	2.284
Crosswalk LOS	F	F	F	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	350	1500	367	0
d_b, Bicycle Delay [s]	40.82	3.74	40.00	59.98
I_b,int, Bicycle LOS Score for Intersection	2.986	2.945	2.944	4.132
Bicycle LOS	C	C	C	D

Sequence

Ring 1	-	2	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



APPENDIX D-II

YEAR 2023 WITH PROJECT TRAFFIC CONDITIONS

Intersection Level Of Service Report
Intersection 1: Tippecanoe Avenue at Mill Street

Control Type:	Signalized	Delay (sec / veh):	26.9
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.689

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Mill Street			Mill Street		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			No			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Mill Street			Mill Street		
Base Volume Input [veh/h]	270	1009	0	15	1072	116	170	16	232	24	12	2
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	270	1009	0	15	1072	116	170	16	232	24	12	2
Peak Hour Factor	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869	0.869
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	78	290	0	4	308	33	49	5	67	7	3	1
Total Analysis Volume [veh/h]	311	1161	0	17	1234	133	196	18	267	28	14	2
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]		0			0			0			0	
v_di, Inbound Pedestrian Volume crossing major street [ped/h]		0			0			0			0	
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]		0			0			0			0	
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]		0			0			0			0	
v_ab, Corner Pedestrian Volume [ped/h]		0			0			0			0	
Bicycle Volume [bicycles/h]		0			0			0			0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Permi	Protec	Permi	Overla	Split	Split	Overla	Split	Split	Split
Signal Group	1	6	0	5	2	2	0	8	8	0	4	0
Auxiliary Signal Groups						2,8			1,8			
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	5	8	0	5	8	8	0	8	8	0	8	0
Maximum Green [s]	30	30	0	30	30	30	0	30	30	0	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	0.0
Split [s]	26	52	0	9	35	35	0	47	47	0	12	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	7	0	7	7	0	0	0
Pedestrian Clearance [s]	0	41	0	0	24	24	0	36	36	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	0.0
Minimum Recall	No	No		No	No	No		No	No		No	
Maximum Recall	No	No		No	No	No		No	No		No	
Pedestrian Recall	No	No		No	No	No		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	R	L	C	R	L	C	R
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	22	84	84	2	64	90	11	11	37	6	6	6
g / C, Green / Cycle	0.18	0.70	0.70	0.02	0.54	0.75	0.10	0.10	0.31	0.05	0.05	0.05
(v / s)_i Volume / Saturation Flow Rate	0.20	0.23	0.23	0.01	0.26	0.09	0.07	0.07	0.18	0.02	0.00	0.00
s, saturation flow rate [veh/h]	1593	3373	1772	1593	4826	1506	1593	1606	1506	1593	3373	1506
c, Capacity [veh/h]	292	2365	1242	29	2587	1129	152	153	470	82	174	78
d1, Uniform Delay [s]	49.01	6.93	6.93	58.44	17.35	4.12	52.63	52.63	34.51	54.93	54.19	54.04
k, delay calibration	0.29	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.24	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	58.22	0.36	0.69	16.54	0.63	0.21	5.75	5.70	2.36	2.41	0.19	0.13
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.06	0.32	0.32	0.58	0.48	0.12	0.70	0.70	0.57	0.34	0.08	0.03
d, Delay for Lane Group [s/veh]	107.2	7.29	7.61	74.97	17.98	4.33	58.37	58.33	36.88	57.34	54.39	54.17
Lane Group LOS	F	A	A	E	B	A	E	E	D	E	D	D
Critical Lane Group	Yes	No	No	No	Yes	No	No	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	13.44	3.59	3.88	0.65	7.10	0.86	3.36	3.38	6.82	0.87	0.21	0.06
50th-Percentile Queue Length [ft/ln]	335.9	89.76	97.09	16.21	177.4	21.55	83.95	84.58	170.4	21.85	5.17	1.51
95th-Percentile Queue Length [veh/ln]	20.07	6.46	6.99	1.17	11.47	1.55	6.04	6.09	11.10	1.57	0.37	0.11
95th-Percentile Queue Length [ft/ln]	501.8	161.5	174.7	29.17	286.6	38.79	151.1	152.2	277.4	39.34	9.30	2.72

Movement, Approach, & Intersection Results

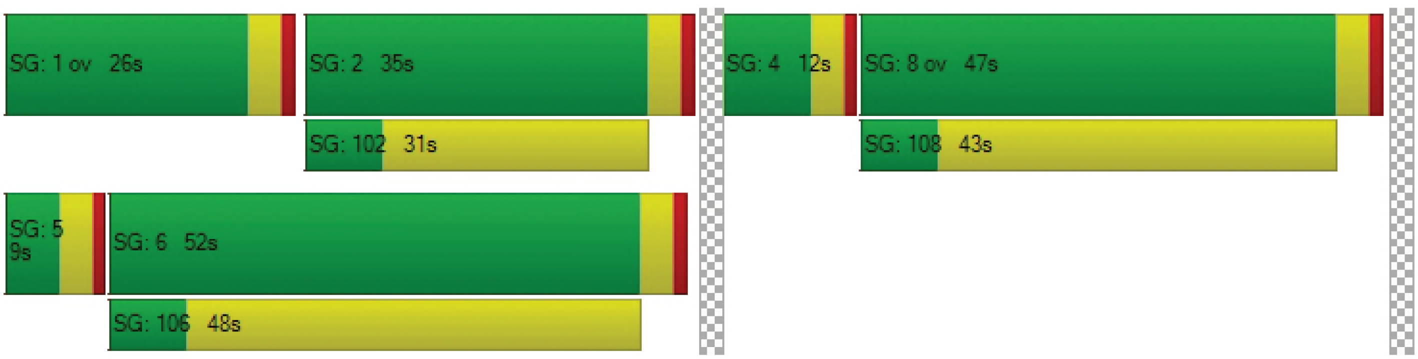
d_M, Delay for Movement [s/veh]	107.2	7.40	7.61	74.97	17.98	4.33	58.35	58.33	36.88	57.34	54.39	54.17
Movement LOS	F	A	A	E	B	A	E	E	D	E	D	D
d_A, Approach Delay [s/veh]	28.49			17.37			46.43			56.26		
Approach LOS	C			B			D			E		
d_I, Intersection Delay [s/veh]	26.85											
Intersection LOS	C											
Intersection V/C	0.689											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.51	0.00	49.51	49.51
I_p,int, Pedestrian LOS Score for Intersection	3.026	0.000	2.497	2.329
Crosswalk LOS	C	F	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	800	517	717	133
d_b, Bicycle Delay [s]	21.61	33.01	24.71	52.27
I_b,int, Bicycle LOS Score for Intersection	2.369	2.321	2.353	1.596
Bicycle LOS	B	B	B	A

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Tippecanoe Avenue at Central Avenue

Control Type:	Signalized	Delay (sec / veh):	29.7
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.640

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Central Avenue			Central Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Central Avenue			Central Avenue		
Base Volume Input [veh/h]	254	970	200	251	1027	146	176	176	72	93	127	209
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	254	970	200	251	1027	146	176	176	72	93	127	209
Peak Hour Factor	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918	0.918
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	69	264	54	68	280	40	48	48	20	25	35	57
Total Analysis Volume [veh/h]	277	1057	218	273	1119	159	192	192	78	101	138	228
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Overla	Protec	Permi	Overla	Protec	Permi	Overla	Protec	Permi	Overla
Signal Group	1	6	6	5	2	2	3	8	8	7	4	4
Auxiliary Signal Groups			6,7			2,3			1,8			4,5
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	8	8	5	8	8	5	8	8	5	8	8
Maximum Green [s]	30	30	30	30	30	30	30	30	30	30	30	30
Amber [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Split [s]	17	34	34	18	35	35	22	47	47	21	46	46
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Walk [s]	0	7	7	0	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	0	23	23	0	24	24	0	36	36	0	35	35
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Recall	No	No	No	No	No	No	No	No	No	No	No	No
Maximum Recall	No	No	No	No	No	No	No	No	No	No	No	No
Pedestrian Recall	No	No	No	No	No	No	No	No	No	No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	R	L	C	R
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00
g_i, Effective Green Time [s]	13	66	79	13	66	86	16	16	33	10	9	26
g / C, Green / Cycle	0.11	0.55	0.66	0.11	0.55	0.72	0.14	0.13	0.27	0.08	0.07	0.22
(v / s)_i Volume / Saturation Flow Rate	0.10	0.22	0.14	0.09	0.23	0.11	0.12	0.06	0.05	0.06	0.04	0.15
s, saturation flow rate [veh/h]	2912	4826	1506	2912	4826	1506	1593	3373	1506	1593	3373	1506
c, Capacity [veh/h]	317	2632	994	324	2643	1081	218	435	408	129	248	328
d1, Uniform Delay [s]	52.69	15.89	8.12	52.34	15.99	5.35	50.86	48.28	33.62	54.11	53.73	43.27
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	7.51	0.46	0.51	5.98	0.50	0.29	10.96	0.70	0.22	9.74	1.95	2.65
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.87	0.40	0.22	0.84	0.42	0.15	0.88	0.44	0.19	0.78	0.56	0.69
d, Delay for Lane Group [s/veh]	60.20	16.35	8.63	58.32	16.49	5.64	61.83	48.98	33.85	63.85	55.68	45.92
Lane Group LOS	E	B	A	E	B	A	E	D	C	E	E	D
Critical Lane Group	Yes	No	No	No	Yes	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	4.44	5.64	2.29	4.30	6.04	1.25	6.32	2.70	1.79	3.34	2.08	6.48
50th-Percentile Queue Length [ft/ln]	110.9	141.0	57.36	107.5	151.0	31.14	157.9	67.60	44.68	83.60	52.05	161.9
95th-Percentile Queue Length [veh/ln]	7.89	9.54	4.13	7.70	10.07	2.24	10.44	4.87	3.22	6.02	3.75	10.65
95th-Percentile Queue Length [ft/ln]	197.3	238.3	103.2	192.5	251.7	56.05	261.0	121.6	80.42	150.4	93.69	266.2

Movement, Approach, & Intersection Results

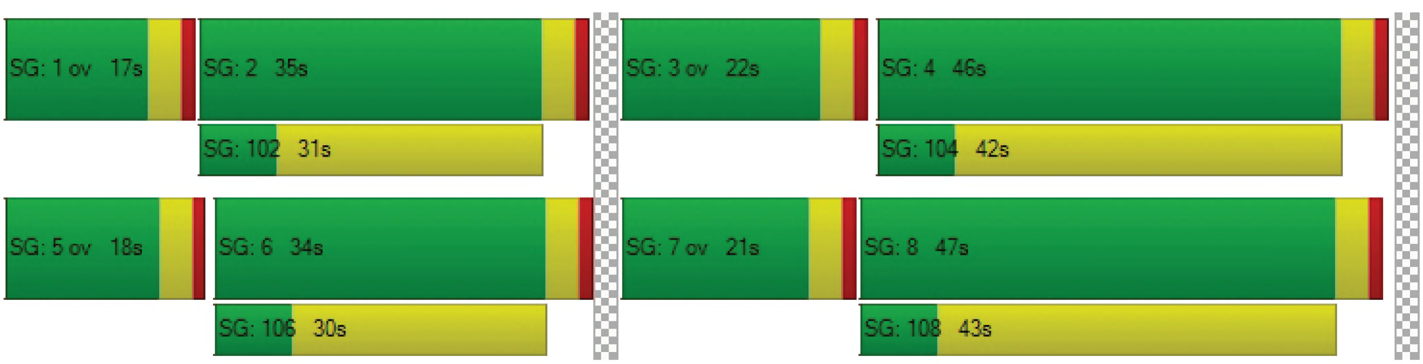
d_M, Delay for Movement [s/veh]	60.20	16.35	8.63	58.32	16.49	5.64	61.83	48.98	33.85	63.85	55.68	45.92
Movement LOS	E	B	A	E	B	A	E	D	C	E	E	D
d_A, Approach Delay [s/veh]	23.09			22.74			51.77			52.68		
Approach LOS	C			C			D			D		
d_I, Intersection Delay [s/veh]	29.67											
Intersection LOS	C											
Intersection V/C	0.640											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.52	49.52	49.52	49.52
I_p,int, Pedestrian LOS Score for Intersection	3.172	3.191	2.635	2.654
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	500	517	716	700
d_b, Bicycle Delay [s]	33.76	33.02	24.72	25.36
I_b,int, Bicycle LOS Score for Intersection	2.413	2.413	1.941	1.945
Bicycle LOS	B	B	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Tippecanoe Avenue at Orange Show Rd/San Bernardino Ave

Control Type:	Signalized	Delay (sec / veh):	34.2
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.837

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Orange Show Rd			San Bernardino Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Orange Show Rd			San Bernardino Ave		
Base Volume Input [veh/h]	102	1038	101	183	908	134	206	312	134	98	243	177
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	102	1038	101	183	908	134	206	312	134	98	243	177
Peak Hour Factor	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881	0.881
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	29	295	29	52	258	38	58	89	38	28	69	50
Total Analysis Volume [veh/h]	116	1178	115	208	1031	152	234	354	152	111	276	201
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Permi	Protec	Permi	Permi	ProtP	Permi	Permi	ProtP	Permi	Permi
Signal Group	1	6	0	5	2	0	3	8	0	7	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	8	0	5	8	0	5	8	0	5	8	0
Maximum Green [s]	30	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	13	35	0	13	35	0	13	42	0	10	39	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	22	0	0	24	0	0	24	0	0	24	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	No		No	No		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	L	C	C
C, Cycle Length [s]	100	100	100	100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00
g_i, Effective Green Time [s]	9	45	45	9	46	46	34	24	24	34	21	21
g / C, Green / Cycle	0.09	0.45	0.45	0.09	0.46	0.46	0.34	0.24	0.24	0.34	0.21	0.21
(v / s)_i Volume / Saturation Flow Rate	0.07	0.37	0.37	0.07	0.34	0.34	0.21	0.15	0.15	0.10	0.14	0.15
s, saturation flow rate [veh/h]	1593	1772	1717	2912	1772	1693	1139	1772	1594	1060	1772	1529
c, Capacity [veh/h]	141	803	779	263	806	771	356	418	376	333	365	315
d1, Uniform Delay [s]	44.84	23.71	23.79	44.60	22.51	22.60	27.62	34.35	34.39	24.84	36.80	36.93
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.22	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	11.23	8.91	9.43	5.34	6.25	6.72	4.14	1.60	1.81	0.58	2.37	2.94
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.82	0.81	0.82	0.79	0.75	0.75	0.66	0.64	0.64	0.33	0.69	0.71
d, Delay for Lane Group [s/veh]	56.07	32.62	33.23	49.94	28.76	29.33	31.76	35.95	36.19	25.42	39.17	39.87
Lane Group LOS	E	C	C	D	C	C	C	D	D	C	D	D
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	3.25	14.75	14.53	2.70	12.58	12.26	4.68	5.92	5.38	1.91	5.91	5.28
50th-Percentile Queue Length [ft/ln]	81.22	368.8	363.3	67.60	314.4	306.4	116.9	147.9	134.5	47.75	147.8	131.9
95th-Percentile Queue Length [veh/ln]	5.85	21.05	20.79	4.87	18.40	18.00	8.22	9.91	9.18	3.44	9.90	9.05
95th-Percentile Queue Length [ft/ln]	146.1	526.3	519.6	121.6	459.9	450.0	205.5	247.7	229.6	85.95	247.5	226.1

Movement, Approach, & Intersection Results

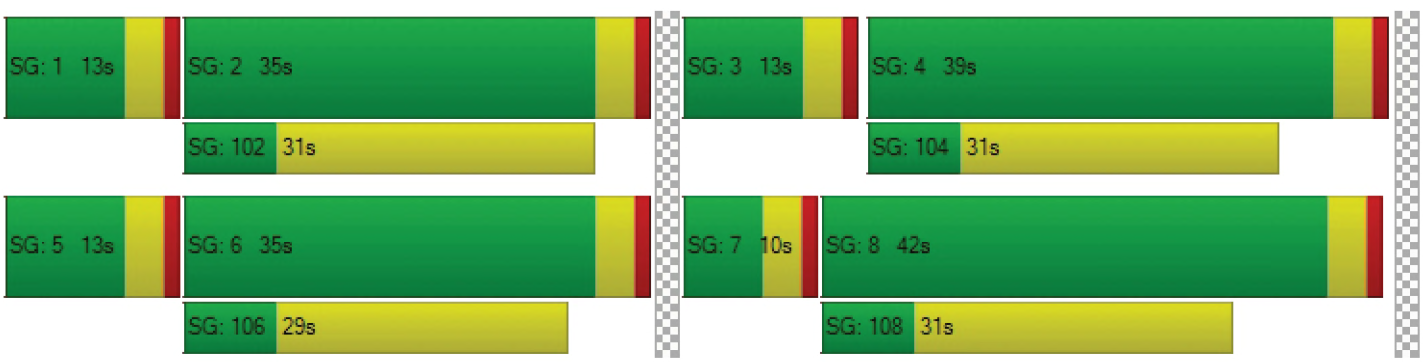
d_M, Delay for Movement [s/veh]	56.07	32.89	33.23	49.94	29.00	29.33	31.76	36.01	36.19	25.42	39.23	39.87
Movement LOS	E	C	C	D	C	C	C	D	D	C	D	D
d_A, Approach Delay [s/veh]	34.82			32.16			34.71			36.84		
Approach LOS	C			C			C			D		
d_I, Intersection Delay [s/veh]	34.19											
Intersection LOS	C											
Intersection V/C	0.837											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	39.62	39.62	39.62	39.62
I_p,int, Pedestrian LOS Score for Intersection	2.872	3.021	2.555	2.551
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	620	620	760	700
d_b, Bicycle Delay [s]	23.82	23.82	19.24	21.14
I_b,int, Bicycle LOS Score for Intersection	2.722	2.707	2.170	2.045
Bicycle LOS	B	B	B	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Tippecanoe Avenue at Harriman Place/I-10 WB Ramps

Control Type:	Signalized	Delay (sec / veh):	29.2
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.610

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Harriman Pl			I-10 WB Ramps		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Harriman Pl			I-10 WB Ramps		
Base Volume Input [veh/h]	200	890	414	0	958	80	62	0	245	588	177	418
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	200	890	414	0	958	80	62	0	245	588	177	418
Peak Hour Factor	0.962	0.962	0.962	1.000	0.962	0.962	0.962	1.000	0.962	0.962	0.962	0.962
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	52	231	108	0	249	21	16	0	64	153	46	109
Total Analysis Volume [veh/h]	208	925	430	0	996	83	64	0	255	611	184	435
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	115
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Protec	Permi	Unsig	Permi	Permi	Permi	Split	Permi	Overla	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	0	3	7	4	0
Auxiliary Signal Groups									1,3			
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	8	8	0	0	8	0	8	0	8	6	8	0
Maximum Green [s]	30	30	0	0	30	0	30	0	30	30	30	0
Amber [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0
Split [s]	14	49	0	0	35	0	12	0	12	10	54	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	21	0	0	24	0	0	0	0	0	39	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0
Minimum Recall	No	No			No		No		No		No	
Maximum Recall	No	No			No		No		No		No	
Pedestrian Recall	No	No			No		No		No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	C	L	R	L	C	R
C, Cycle Length [s]	115	115	115	115	115	115	115	115	115
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	10	66	52	52	8	55	29	29	29
g / C, Green / Cycle	0.09	0.57	0.45	0.45	0.07	0.48	0.25	0.25	0.25
(v / s)_i Volume / Saturation Flow Rate	0.07	0.19	0.17	0.16	0.04	0.10	0.22	0.19	0.21
s, saturation flow rate [veh/h]	2912	4826	4826	1680	1593	2665	2752	1653	1506
c, Capacity [veh/h]	254	2767	2178	758	111	1277	708	417	380
d1, Uniform Delay [s]	51.60	12.95	20.80	20.63	51.84	17.26	41.42	39.56	40.47
k, delay calibration	0.11	0.50	0.50	0.50	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	6.39	0.33	0.49	1.30	4.60	0.08	3.28	2.62	4.27
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.82	0.33	0.37	0.36	0.57	0.20	0.86	0.74	0.81
d, Delay for Lane Group [s/veh]	58.00	13.28	21.29	21.93	56.44	17.33	44.70	42.17	44.74
Lane Group LOS	E	B	C	C	E	B	D	D	D
Critical Lane Group	Yes	No	Yes	No	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	3.17	4.18	4.84	4.98	1.93	1.96	8.58	8.30	8.63
50th-Percentile Queue Length [ft/ln]	79.23	104.48	121.01	124.41	48.30	48.88	214.5	207.5	215.8
95th-Percentile Queue Length [veh/ln]	5.70	7.52	8.45	8.63	3.48	3.52	13.39	13.03	13.45
95th-Percentile Queue Length [ft/ln]	142.62	188.06	211.21	215.87	86.94	87.99	334.6	325.7	336.3

Movement, Approach, & Intersection Results

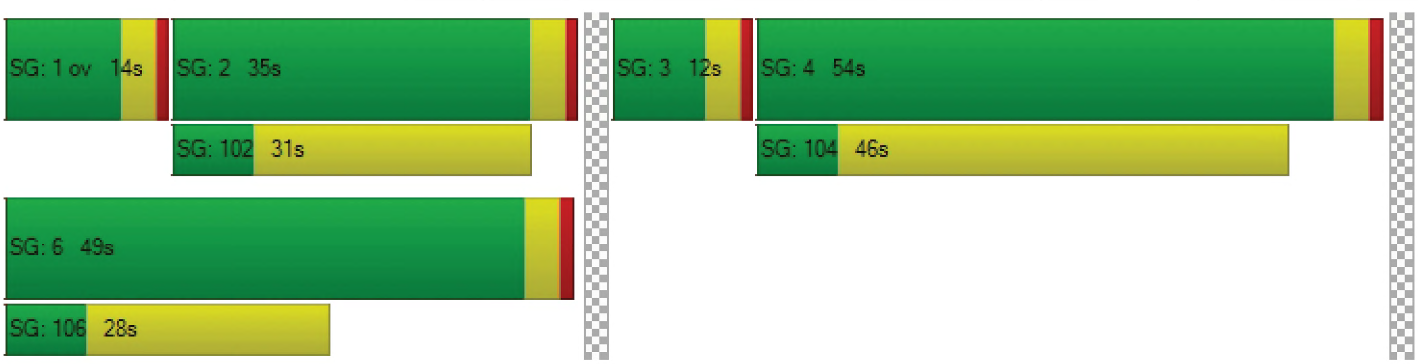
d_M, Delay for Movement [s/veh]	58.00	13.28	0.00	0.00	21.41	21.93	56.44	0.00	17.33	44.70	42.17	44.00
Movement LOS	E	B			C	C	E		B	D	D	D
d_A, Approach Delay [s/veh]	21.49			21.45			25.18			44.07		
Approach LOS	C			C			C			D		
d_I, Intersection Delay [s/veh]	29.18											
Intersection LOS	C											
Intersection V/C	0.610											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	47.04	47.04	47.04
I_p,int, Pedestrian LOS Score for Intersection	0.000	2.954	2.466	2.551
Crosswalk LOS	F	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	782	539	139	869
d_b, Bicycle Delay [s]	21.31	30.69	49.79	18.38
I_b,int, Bicycle LOS Score for Intersection	2.183	2.005	1.560	3.589
Bicycle LOS	B	B	A	D

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report

Intersection 5: Tippecanoe Avenue/Anderson Street at I-10 EB Ramps

Control Type:	Signalized	Delay (sec / veh):	24.2
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.737

Intersection Setup

Name	Tippecanoe Ave			Anderson St			I-10 EB Ramps			I-10 EB Ramps		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No					
Crosswalk	No			No			No			Yes		

Volumes

Name	Tippecanoe Ave			Anderson St			I-10 EB Ramps			I-10 EB Ramps		
Base Volume Input [veh/h]	0	792	323	262	966	0	712	3	727	0	0	0
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	792	323	262	966	0	712	3	727	0	0	0
Peak Hour Factor	1.000	0.935	0.935	0.935	0.935	1.000	0.935	0.935	0.935	1.000	1.000	1.000
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	0	212	86	70	258	0	190	1	194	0	0	0
Total Analysis Volume [veh/h]	0	847	345	280	1033	0	761	3	778	0	0	0
Presence of On-Street Parking	No		No	No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permi	Permi	Permi	Protec	Permi	Permi	Split	Split	Split	Permi	Permi	Permi
Signal Group	0	6	0	5	2	0	0	8	0	0	0	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	0	8	0	8	8	0	0	8	0	0	0	0
Maximum Green [s]	0	30	0	30	30	0	0	30	0	0	0	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
Split [s]	0	29	0	14	43	0	0	47	0	0	0	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Walk [s]	0	7	0	0	0	0	0	0	0	0	0	0
Pedestrian Clearance [s]	0	14	0	0	0	0	0	0	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No				
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Minimum Recall		No		No	No			No				
Maximum Recall		No		No	No			No				
Pedestrian Recall		No		No	No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	R	L	C	L	C	R	
C, Cycle Length [s]	90	90	90	90	90	90	90	
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]	37	37	10	51	31	31	31	
g / C, Green / Cycle	0.41	0.41	0.11	0.57	0.34	0.34	0.34	
(v / s)_i Volume / Saturation Flow Rate	0.25	0.23	0.10	0.31	0.24	0.24	0.29	
s, saturation flow rate [veh/h]	3373	1506	2912	3373	1593	1594	2665	
c, Capacity [veh/h]	1385	618	326	1912	549	549	918	
d1, Uniform Delay [s]	20.89	20.30	39.29	12.18	25.46	25.46	27.34	
k, delay calibration	0.50	0.50	0.11	0.50	0.11	0.11	0.11	
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]	2.02	3.61	6.58	1.10	1.61	1.60	2.28	
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity	0.61	0.56	0.86	0.54	0.70	0.70	0.85	
d, Delay for Lane Group [s/veh]	22.92	23.91	45.87	13.28	27.07	27.06	29.62	
Lane Group LOS	C	C	D	B	C	C	C	
Critical Lane Group	Yes	No	Yes	No	No	No	Yes	
50th-Percentile Queue Length [veh/ln]	7.09	5.92	3.29	6.21	7.04	7.03	7.72	
50th-Percentile Queue Length [ft/ln]	177.17	148.02	82.32	155.17	175.9	175.8	192.9	
95th-Percentile Queue Length [veh/ln]	11.45	9.91	5.93	10.29	11.39	11.38	12.27	
95th-Percentile Queue Length [ft/ln]	286.32	247.78	148.17	257.31	284.6	284.6	306.8	

Movement, Approach, & Intersection Results

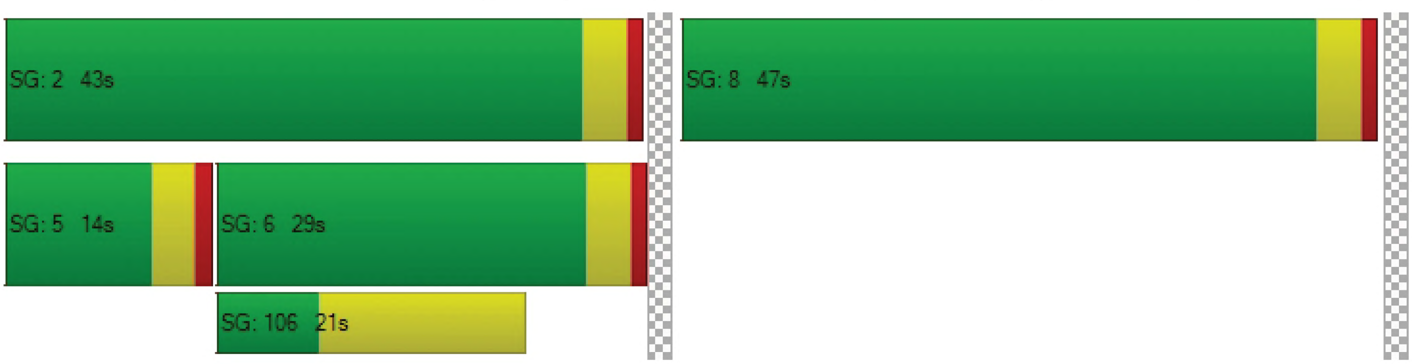
d_M, Delay for Movement [s/veh]	0.00	22.92	23.91	45.87	13.28	0.00	27.06	27.06	29.62	0.00	0.00	0.00
Movement LOS		C	C	D	B		C	C	C			
d_A, Approach Delay [s/veh]	23.20			20.23			28.35			0.00		
Approach LOS	C			C			C			A		
d_I, Intersection Delay [s/veh]	24.20											
Intersection LOS	C											
Intersection V/C	0.737											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	34.68
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	2.021
Crosswalk LOS	F	F	F	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	555	866	955	0
d_b, Bicycle Delay [s]	23.48	14.46	12.28	45.01
I_b,int, Bicycle LOS Score for Intersection	2.543	2.643	4.104	4.132
Bicycle LOS	B	B	D	D

Sequence

Ring 1	-	2	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 1: Tippecanoe Avenue at Mill Street

Control Type:	Signalized	Delay (sec / veh):	20.3
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.593

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Mill Street			Mill Street		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			No			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Mill Street			Mill Street		
Base Volume Input [veh/h]	136	1384	0	1	1049	219	268	15	316	8	12	4
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	136	1384	0	1	1049	219	268	15	316	8	12	4
Peak Hour Factor	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889	0.889
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	38	389	0	0	295	62	75	4	89	2	3	1
Total Analysis Volume [veh/h]	153	1557	0	1	1180	246	301	17	355	9	13	4
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Permi	Protec	Permi	Overla	Split	Split	Overla	Split	Split	Split
Signal Group	1	6	0	5	2	2	0	8	8	0	4	0
Auxiliary Signal Groups						2,8			1,8			
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	5	8	0	5	8	8	0	8	8	0	8	0
Maximum Green [s]	30	30	0	30	30	30	0	30	30	0	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	0.0
Split [s]	22	52	0	9	39	39	0	47	47	0	12	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	7	0	7	7	0	0	0
Pedestrian Clearance [s]	0	41	0	0	24	24	0	36	36	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	0.0
Minimum Recall	No	No		No	No	No		No	No		No	
Maximum Recall	No	No		No	No	No		No	No		No	
Pedestrian Recall	No	No		No	No	No		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	R	L	C	R	L	C	R
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	18	83	83	0	65	94	16	16	38	5	5	5
g / C, Green / Cycle	0.15	0.69	0.69	0.00	0.54	0.78	0.13	0.13	0.32	0.04	0.04	0.04
(v / s)_i Volume / Saturation Flow Rate	0.10	0.30	0.30	0.00	0.24	0.16	0.10	0.10	0.24	0.01	0.00	0.00
s, saturation flow rate [veh/h]	1593	3373	1772	1593	4826	1506	1593	1602	1506	1593	3373	1506
c, Capacity [veh/h]	239	2333	1225	3	2622	1179	214	215	478	62	132	59
d1, Uniform Delay [s]	47.95	8.19	8.19	59.83	16.57	3.37	49.97	49.96	36.56	55.73	55.63	55.56
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.41	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.83	0.60	1.14	56.60	0.56	0.40	5.02	4.98	8.28	1.05	0.32	0.48
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.64	0.44	0.44	0.34	0.45	0.21	0.74	0.74	0.74	0.14	0.10	0.07
d, Delay for Lane Group [s/veh]	50.78	8.79	9.32	116.4	17.13	3.77	54.98	54.94	44.84	56.78	55.95	56.04
Lane Group LOS	D	A	A	F	B	A	D	D	D	E	E	E
Critical Lane Group	Yes	No	No	No	Yes	No	No	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	4.50	5.60	6.06	0.08	6.56	1.41	4.88	4.90	10.33	0.28	0.20	0.12
50th-Percentile Queue Length [ft/ln]	112.3	139.8	151.5	1.92	163.8	35.20	121.9	122.3	258.2	7.05	4.90	3.12
95th-Percentile Queue Length [veh/ln]	7.97	9.48	10.10	0.14	10.75	2.53	8.50	8.52	15.60	0.51	0.35	0.22
95th-Percentile Queue Length [ft/ln]	199.3	236.8	252.4	3.46	268.8	63.37	212.4	213.0	390.0	12.69	8.83	5.62

Movement, Approach, & Intersection Results

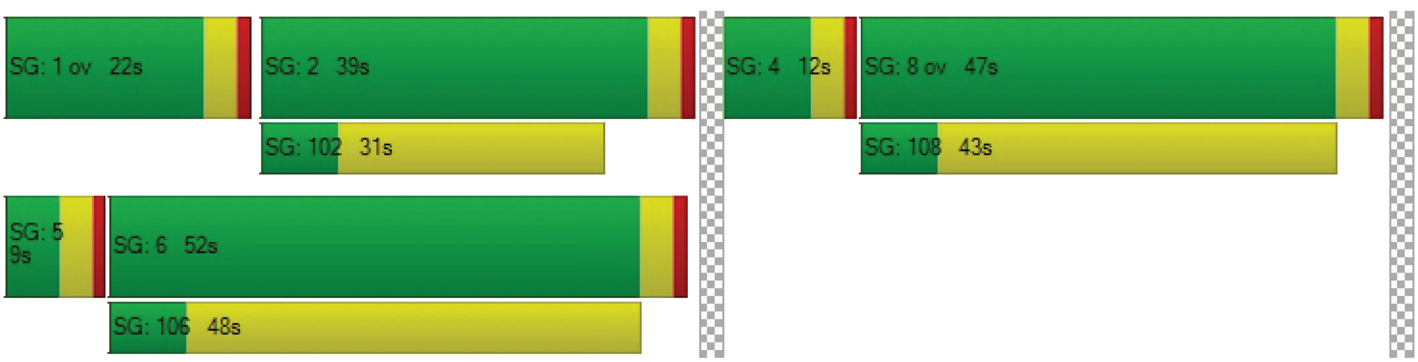
d_M, Delay for Movement [s/veh]	50.78	8.97	9.32	116.4	17.13	3.77	54.96	54.94	44.84	56.78	55.95	56.04
Movement LOS	D	A	A	F	B	A	D	D	D	E	E	E
d_A, Approach Delay [s/veh]	12.71			14.90			49.62			56.25		
Approach LOS	B			B			D			E		
d_I, Intersection Delay [s/veh]	20.30											
Intersection LOS	C											
Intersection V/C	0.593											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.51	0.00	49.51	49.51
I_p,int, Pedestrian LOS Score for Intersection	3.061	0.000	2.525	2.322
Crosswalk LOS	C	F	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	800	583	717	133
d_b, Bicycle Delay [s]	21.61	30.11	24.71	52.27
I_b,int, Bicycle LOS Score for Intersection	2.500	2.344	2.670	1.581
Bicycle LOS	B	B	B	A

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Tippecanoe Avenue at Central Avenue

Control Type:	Signalized	Delay (sec / veh):	37.4
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.695

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Central Avenue			Central Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Central Avenue			Central Avenue		
Base Volume Input [veh/h]	312	989	89	211	1146	161	260	125	92	125	175	211
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	312	989	89	211	1146	161	260	125	92	125	175	211
Peak Hour Factor	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	81	257	23	55	298	42	68	32	24	32	45	55
Total Analysis Volume [veh/h]	324	1028	93	219	1191	167	270	130	96	130	182	219
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Overla	Protec	Permi	Overla	Protec	Permi	Overla	Protec	Permi	Overla
Signal Group	1	6	6	5	2	2	3	8	8	7	4	4
Auxiliary Signal Groups			6,7			2,3			1,8			4,5
Lead / Lag	Lead	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	8	8	5	8	8	5	8	8	5	8	8
Maximum Green [s]	30	30	30	30	30	30	30	30	30	30	30	30
Amber [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Split [s]	16	34	34	17	35	35	23	47	47	22	46	46
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Walk [s]	0	7	7	0	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	0	23	23	0	24	24	0	36	36	0	35	35
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Recall	No	No	No	No	No	No	No	No	No	No	No	No
Maximum Recall	No	No	No	No	No	No	No	No	No	No	No	No
Pedestrian Recall	No	No	No	No	No	No	No	No	No	No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	R	L	C	R
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	2.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00
g_i, Effective Green Time [s]	12	63	95	13	64	87	19	17	33	12	9	49
g / C, Green / Cycle	0.10	0.52	0.80	0.11	0.53	0.72	0.16	0.14	0.27	0.10	0.08	0.41
(v / s)_i Volume / Saturation Flow Rate	0.11	0.21	0.06	0.08	0.25	0.11	0.19	0.04	0.06	0.08	0.05	0.15
s, saturation flow rate [veh/h]	2912	4826	1506	2752	4826	1506	1417	3373	1506	1593	3373	1506
c, Capacity [veh/h]	293	2524	1197	311	2556	1087	263	467	410	156	263	618
d1, Uniform Delay [s]	54.00	17.36	2.69	53.85	17.63	5.23	53.41	46.35	33.96	53.17	53.95	24.42
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.28	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	59.13	0.49	0.13	2.90	0.61	0.30	48.63	0.32	0.29	10.77	3.26	0.34
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.11	0.41	0.08	0.70	0.47	0.15	1.03	0.28	0.23	0.83	0.69	0.35
d, Delay for Lane Group [s/veh]	113.1	17.85	2.82	56.75	18.24	5.53	102.0	46.67	34.25	63.94	57.21	24.76
Lane Group LOS	F	B	A	E	B	A	F	D	C	E	E	C
Critical Lane Group	Yes	No	No	No	Yes	No	Yes	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	6.82	5.79	0.43	3.38	6.88	1.29	11.55	1.77	2.23	4.32	2.80	4.36
50th-Percentile Queue Length [ft/ln]	170.4	144.6	10.82	84.61	171.9	32.23	288.7	44.22	55.68	107.9	69.99	108.9
95th-Percentile Queue Length [veh/ln]	11.51	9.73	0.78	6.09	11.18	2.32	17.35	3.18	4.01	7.72	5.04	7.78
95th-Percentile Queue Length [ft/ln]	287.8	243.2	19.48	152.3	279.4	58.01	433.8	79.59	100.2	193.0	125.9	194.5

Movement, Approach, & Intersection Results

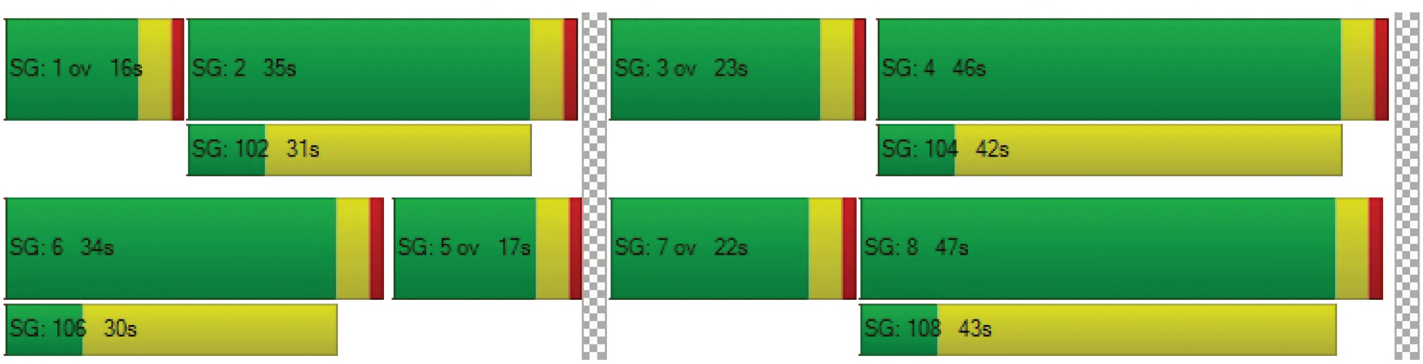
d_M, Delay for Movement [s/veh]	113.1	17.85	2.82	56.75	18.24	5.53	102.0	46.67	34.25	63.94	57.21	24.76
Movement LOS	F	B	A	E	B	A	F	D	C	E	E	C
d_A, Approach Delay [s/veh]	38.25			22.24			74.41			45.48		
Approach LOS	D			C			E			D		
d_I, Intersection Delay [s/veh]	37.39											
Intersection LOS	D											
Intersection V/C	0.695											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.52	49.52	49.52	49.52
I_p,int, Pedestrian LOS Score for Intersection	3.173	3.582	2.657	2.936
Crosswalk LOS	C	D	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	500	517	716	700
d_b, Bicycle Delay [s]	33.76	33.02	24.72	25.36
I_b,int, Bicycle LOS Score for Intersection	2.354	2.427	1.969	1.998
Bicycle LOS	B	B	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Tippecanoe Avenue at Orange Show Rd/San Bernardino Ave

Control Type:	Signalized	Delay (sec / veh):	46.3
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.906

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Orange Show Rd			San Bernardino Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Orange Show Rd			San Bernardino Ave		
Base Volume Input [veh/h]	113	1101	110	273	1051	169	229	449	141	73	356	238
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	113	1101	110	273	1051	169	229	449	141	73	356	238
Peak Hour Factor	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928	0.928
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	30	297	30	74	283	46	62	121	38	20	96	64
Total Analysis Volume [veh/h]	122	1186	119	294	1133	182	247	484	152	79	384	256
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Protec	Permi	Permi	Protec	Permi	Permi	ProtP	Permi	Permi	ProtP	Permi	Permi
Signal Group	1	6	0	5	2	0	3	8	0	7	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	8	0	5	8	0	5	8	0	5	8	0
Maximum Green [s]	30	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	15	47	0	18	50	0	15	45	0	10	40	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	22	0	0	24	0	0	24	0	0	24	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	No		No	No		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	L	C	C
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00
g_i, Effective Green Time [s]	11	50	50	14	53	53	44	35	35	44	29	29
g / C, Green / Cycle	0.09	0.42	0.42	0.12	0.44	0.44	0.37	0.29	0.29	0.37	0.24	0.24
(v / s)_i Volume / Saturation Flow Rate	0.08	0.37	0.38	0.10	0.38	0.38	0.24	0.19	0.19	0.09	0.19	0.19
s, saturation flow rate [veh/h]	1593	1772	1716	2912	1772	1688	1026	1772	1628	929	1772	1539
c, Capacity [veh/h]	144	739	715	338	784	747	318	509	468	297	429	372
d1, Uniform Delay [s]	53.75	32.52	32.66	52.15	29.90	30.28	32.70	37.47	37.48	27.12	42.69	42.79
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.42	0.12	0.12	0.11	0.19	0.20
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	12.55	15.54	16.61	6.91	11.19	13.00	14.57	1.58	1.72	0.48	5.91	7.17
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.85	0.89	0.90	0.87	0.85	0.87	0.78	0.65	0.65	0.27	0.80	0.80
d, Delay for Lane Group [s/veh]	66.29	48.06	49.27	59.06	41.09	43.27	47.26	39.05	39.20	27.60	48.61	49.95
Lane Group LOS	E	D	D	E	D	D	D	D	D	C	D	D
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	4.13	20.65	20.40	4.67	19.25	19.25	6.60	8.72	8.04	1.55	10.15	9.04
50th-Percentile Queue Length [ft/ln]	103.1	516.3	510.0	116.7	481.1	481.2	165.1	217.8	200.8	38.78	253.6	225.9
95th-Percentile Queue Length [veh/ln]	7.43	28.11	27.81	8.21	26.44	26.44	10.82	13.56	12.68	2.79	15.37	13.97
95th-Percentile Queue Length [ft/ln]	185.7	702.6	695.2	205.3	661.0	661.0	270.4	338.9	317.1	69.80	384.2	349.1

Movement, Approach, & Intersection Results

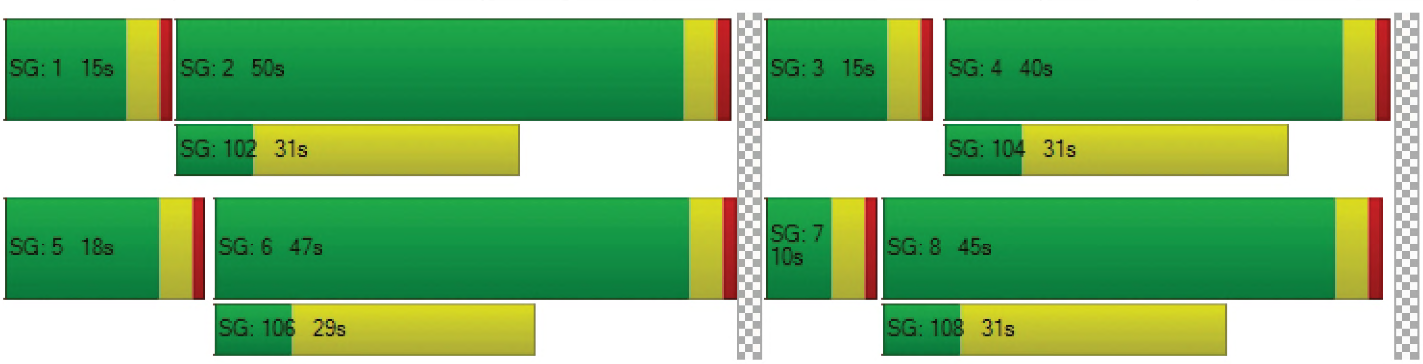
d_M, Delay for Movement [s/veh]	66.29	48.60	49.27	59.06	41.99	43.27	47.26	39.09	39.20	27.60	48.76	49.95
Movement LOS	E	D	D	E	D	D	D	D	D	C	D	D
d_A, Approach Delay [s/veh]		50.17			45.25			41.40			46.86	
Approach LOS		D			D			D			D	
d_I, Intersection Delay [s/veh]	46.28											
Intersection LOS	D											
Intersection V/C	0.906											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.50	49.50	49.50	49.50
I_p,int, Pedestrian LOS Score for Intersection	2.892	3.094	2.620	2.629
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	717	767	683	600
d_b, Bicycle Delay [s]	24.70	22.82	26.00	29.40
I_b,int, Bicycle LOS Score for Intersection	2.737	2.887	2.288	2.153
Bicycle LOS	B	C	B	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report

Intersection 4: Tippecanoe Avenue at Harriman Place/I-10 WB Ramps

Control Type:	Signalized	Delay (sec / veh):	40.4
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.970

Intersection Setup

Name	Tippecanoe Ave			Tippecanoe Ave			Harriman Pl			I-10 WB Ramps		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			Yes		

Volumes

Name	Tippecanoe Ave			Tippecanoe Ave			Harriman Pl			I-10 WB Ramps		
Base Volume Input [veh/h]	361	820	648	0	1394	203	175	0	685	241	272	433
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	361	820	648	0	1394	203	175	0	685	241	272	433
Peak Hour Factor	0.949	0.949	0.949	1.000	0.949	0.949	0.949	1.000	0.949	0.949	0.949	0.949
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	95	216	171	0	367	53	46	0	180	63	72	114
Total Analysis Volume [veh/h]	380	864	683	0	1469	214	184	0	722	254	287	456
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [ped/h]	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Protec	Permi	Unsig	Permi	Permi	Permi	Split	Permi	Overla	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	0	3	7	4	0
Auxiliary Signal Groups									1,3			
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	8	8	0	0	8	0	8	0	8	6	8	0
Maximum Green [s]	30	30	0	0	30	0	30	0	30	30	30	0
Amber [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0	0.0
Split [s]	18	53	0	0	35	0	17	0	17	10	50	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	21	0	0	24	0	0	0	0	0	39	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0	0.0
Minimum Recall	No	No			No		No		No		No	
Maximum Recall	No	No			No		No		No		No	
Pedestrian Recall	No	No			No		No		No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	C	L	R	L	C	R
C, Cycle Length [s]	120	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	14	62	44	44	13	68	33	33	33
g / C, Green / Cycle	0.12	0.52	0.37	0.37	0.11	0.56	0.27	0.27	0.27
(v / s)_i Volume / Saturation Flow Rate	0.13	0.18	0.26	0.26	0.12	0.27	0.09	0.22	0.25
s, saturation flow rate [veh/h]	2912	4826	4826	1626	1593	2665	2752	1703	1506
c, Capacity [veh/h]	341	2501	1775	598	173	1507	762	465	411
d1, Uniform Delay [s]	53.00	16.96	32.48	32.36	53.50	15.55	35.04	40.59	42.13
k, delay calibration	0.11	0.50	0.50	0.50	0.11	0.11	0.11	0.14	0.20
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	60.69	0.38	2.45	6.80	49.22	0.25	0.25	4.27	12.81
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.11	0.35	0.71	0.70	1.06	0.48	0.33	0.80	0.90
d, Delay for Lane Group [s/veh]	113.69	17.34	34.93	39.16	102.72	15.80	35.29	44.86	54.94
Lane Group LOS	F	B	C	D	F	B	D	D	D
Critical Lane Group	Yes	No	Yes	No	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	8.01	4.71	10.76	11.45	7.59	5.81	3.02	10.70	12.00
50th-Percentile Queue Length [ft/ln]	200.17	117.65	268.93	286.13	189.83	145.18	75.50	267.5	299.9
95th-Percentile Queue Length [veh/ln]	13.19	8.26	16.14	16.99	12.40	9.76	5.44	16.07	17.68
95th-Percentile Queue Length [ft/ln]	329.76	206.59	403.40	424.84	309.89	243.99	135.8	401.6	441.9

Movement, Approach, & Intersection Results

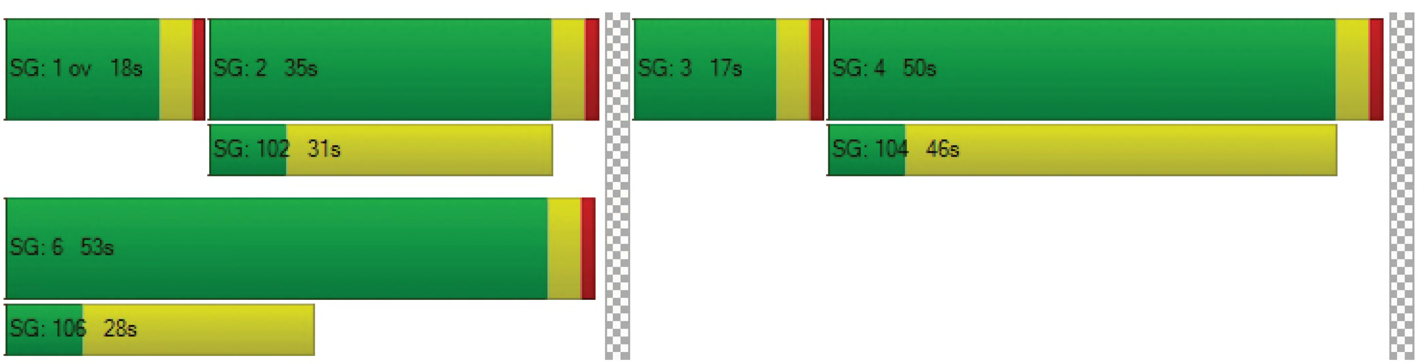
d_M, Delay for Movement [s/veh]	113.6	17.34	0.00	0.00	35.52	39.16	102.7	0.00	15.80	35.29	44.86	53.08
Movement LOS	F	B			D	D	F		B	D	D	D
d_A, Approach Delay [s/veh]	46.78			35.99			33.45			46.18		
Approach LOS	D			D			C			D		
d_I, Intersection Delay [s/veh]	40.39											
Intersection LOS	D											
Intersection V/C	0.970											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	49.52	49.52	49.52
I_p,int, Pedestrian LOS Score for Intersection	0.000	3.052	2.662	2.508
Crosswalk LOS	F	C	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	816	517	217	766
d_b, Bicycle Delay [s]	21.02	33.02	47.72	22.83
I_b,int, Bicycle LOS Score for Intersection	2.244	2.254	1.560	3.205
Bicycle LOS	B	B	A	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Tippecanoe Avenue/Anderson Street at I-10 EB Ramps

Control Type:	Signalized	Delay (sec / veh):	36.7
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.911

Intersection Setup

Name	Tippecanoe Ave			Anderson St			I-10 EB Ramps			I-10 EB Ramps		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No					
Crosswalk	No			No			No			Yes		

Volumes

Name	Tippecanoe Ave			Anderson St			I-10 EB Ramps			I-10 EB Ramps		
Base Volume Input [veh/h]	0	1320	378	740	915	0	490	3	336	0	0	0
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	1320	378	740	915	0	490	3	336	0	0	0
Peak Hour Factor	1.000	0.976	0.976	0.976	0.976	1.000	0.976	0.976	0.976	1.000	1.000	1.000
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Total 15-Minute Volume [veh/h]	0	338	97	190	234	0	126	1	86	0	0	0
Total Analysis Volume [veh/h]	0	1352	387	758	938	0	502	3	344	0	0	0
Presence of On-Street Parking	No		No	No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major street [ped/h]		0			0			0			0	
v_di, Inbound Pedestrian Volume crossing major street [ped/h]		0			0			0			0	
v_co, Outbound Pedestrian Volume crossing minor street [ped/h]		0			0			0			0	
v_ci, Inbound Pedestrian Volume crossing minor street [ped/h]		0			0			0			0	
v_ab, Corner Pedestrian Volume [ped/h]		0			0			0			0	
Bicycle Volume [bicycles/h]		0			0			0			0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permi	Permi	Permi	Protec	Permi	Permi	Split	Split	Split	Permi	Permi	Permi
Signal Group	0	6	0	5	2	0	0	8	0	0	0	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	0	8	0	8	8	0	0	8	0	0	0	0
Maximum Green [s]	0	30	0	30	30	0	0	30	0	0	0	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
Split [s]	0	25	0	69	94	0	0	26	0	0	0	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Walk [s]	0	7	0	0	0	0	0	0	0	0	0	0
Pedestrian Clearance [s]	0	14	0	0	0	0	0	0	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No				
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Minimum Recall		No		No	No			No				
Maximum Recall		No		No	No			No				
Pedestrian Recall		No		No	No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	R	L	C	L	C	R	
C, Cycle Length [s]	120	120	120	120	120	120	120	
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]	52	52	35	91	21	21	21	
g / C, Green / Cycle	0.44	0.44	0.29	0.76	0.18	0.18	0.18	
(v / s)_i Volume / Saturation Flow Rate	0.40	0.26	0.26	0.28	0.16	0.16	0.13	
s, saturation flow rate [veh/h]	3373	1506	2912	3373	1593	1594	2665	
c, Capacity [veh/h]	1475	658	837	2557	279	280	467	
d1, Uniform Delay [s]	31.70	25.56	41.16	4.87	48.45	48.45	46.82	
k, delay calibration	0.50	0.50	0.11	0.50	0.18	0.18	0.11	
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]	10.51	3.82	4.07	0.41	16.00	15.95	2.28	
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity	0.92	0.59	0.91	0.37	0.90	0.90	0.74	
d, Delay for Lane Group [s/veh]	42.21	29.39	45.23	5.28	64.45	64.40	49.09	
Lane Group LOS	D	C	D	A	E	E	D	
Critical Lane Group	Yes	No	Yes	No	Yes	No	No	
50th-Percentile Queue Length [veh/ln]	20.07	8.97	11.16	3.51	8.62	8.62	5.00	
50th-Percentile Queue Length [ft/ln]	501.69	224.25	278.95	87.82	215.4	215.4	125.1	
95th-Percentile Queue Length [veh/ln]	27.41	13.88	16.64	6.32	13.43	13.43	8.67	
95th-Percentile Queue Length [ft/ln]	685.36	347.04	415.90	158.07	335.8	335.8	216.8	

Movement, Approach, & Intersection Results

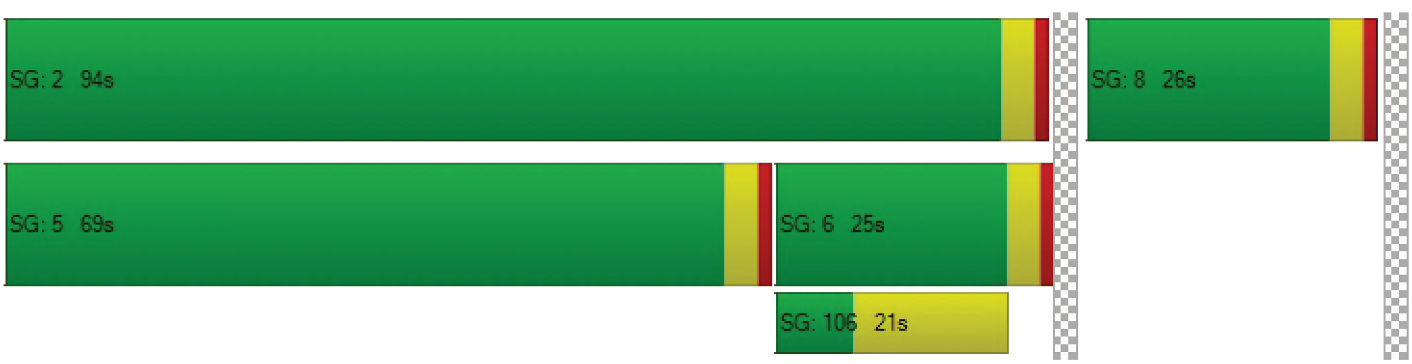
d_M, Delay for Movement [s/veh]	0.00	42.21	29.39	45.23	5.28	0.00	64.42	64.40	49.09	0.00	0.00	0.00
Movement LOS		D	C	D	A		E	E	D			
d_A, Approach Delay [s/veh]	39.35			23.13			58.21			0.00		
Approach LOS	D			C			E			A		
d_I, Intersection Delay [s/veh]	36.67											
Intersection LOS	D											
Intersection V/C	0.911											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	49.49
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	2.288
Crosswalk LOS	F	F	F	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	350	1500	367	0
d_b, Bicycle Delay [s]	40.82	3.74	40.00	59.98
I_b,int, Bicycle LOS Score for Intersection	2.994	2.959	2.960	4.132
Bicycle LOS	C	C	C	D

Sequence

Ring 1	-	2	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



APPENDIX E

PROJECT DRIVEWAY LEVEL OF SERVICE CALCULATION WORKSHEETS

Intersection Level Of Service Report
Intersection 6: Tippecanoe Avenue at Project Driveway No.1

Control Type:	Two-way stop	Delay (sec / veh):	17.0
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.082

Intersection Setup

Name	Tippecanoe Ave		Tippecanoe Ave		Project Dwy No. 1	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Tippecanoe Ave		Tippecanoe Ave		Project Dwy No. 1	
Base Volume Input [veh/h]	0	1355	1328	0	0	26
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	1355	1328	0	0	26
Peak Hour Factor	1.0000	0.9500	0.9500	0.9500	1.0000	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	357	349	0	0	7
Total Analysis Volume [veh/h]	0	1426	1398	0	0	27
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.01	0.01	0.00	0.00	0.08
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	0.00	0.00	16.96
Movement LOS		A	A	A		C
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.00	0.00	0.00	0.27
95th-Percentile Queue Length [ft/ln]	0.00	0.00	0.00	0.00	0.00	6.68
d_A, Approach Delay [s/veh]	0.00		0.00		16.96	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.16					
Intersection LOS	C					

Intersection Level Of Service Report
Intersection 7: Project Driveway No. 2 at Central Avenue

Control Type:	Two-way stop	Delay (sec / veh):	13.4
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.086

Intersection Setup

Name	Project Dwy No. 2		Central Ave		Central Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	Project Dwy No. 2		Central Ave		Central Ave	
Base Volume Input [veh/h]	39	20	0	528	524	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	39	20	0	528	524	0
Peak Hour Factor	0.9500	0.9500	1.0000	0.9500	0.9500	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	10	5	0	139	138	0
Total Analysis Volume [veh/h]	41	21	0	556	552	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	Yes		
Number of Storage Spaces in Median	2	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.09	0.03	0.00	0.01	0.01	0.00
d_M, Delay for Movement [s/veh]	13.38	10.85	0.00	0.00	0.00	0.00
Movement LOS	B	B		A	A	
95th-Percentile Queue Length [veh/ln]	0.39	0.39	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	9.66	9.66	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	12.53		0.00		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	0.66					
Intersection LOS	B					

Intersection Level Of Service Report
Intersection 8: Project Driveway No. 3 at Central Avenue

Control Type:	Two-way stop	Delay (sec / veh):	8.8
Analysis Method:	HCM 6th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.019

Intersection Setup

Name	Project Dwy No. 3		Central Ave		Central Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Project Dwy No. 3		Central Ave		Central Ave	
Base Volume Input [veh/h]	0	0	17	551	524	47
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	17	551	524	47
Peak Hour Factor	1.0000	1.0000	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	4	145	138	12
Total Analysis Volume [veh/h]	0	0	18	580	552	49
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			
Number of Storage Spaces in Median	2	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.02	0.01	0.01	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	8.77	0.00	0.00	0.00
Movement LOS			A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.06	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	0.00	0.00	1.41	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	0.00		0.26		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0.13					
Intersection LOS	A					

Intersection Level Of Service Report
Intersection 6: Tippecanoe Avenue at Project Driveway No.1

Control Type:	Two-way stop	Delay (sec / veh):	17.6
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.080

Intersection Setup

Name	Tippecanoe Ave		Tippecanoe Ave		Project Dwy No. 1	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Tippecanoe Ave		Tippecanoe Ave		Project Dwy No. 1	
Base Volume Input [veh/h]	0	1460	1396	0	0	24
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	1460	1396	0	0	24
Peak Hour Factor	1.0000	0.9500	0.9500	0.9500	1.0000	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	384	367	0	0	6
Total Analysis Volume [veh/h]	0	1537	1469	0	0	25
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.02	0.01	0.00	0.00	0.08
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	0.00	0.00	17.59
Movement LOS		A	A	A		C
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.00	0.00	0.00	0.26
95th-Percentile Queue Length [ft/ln]	0.00	0.00	0.00	0.00	0.00	6.51
d_A, Approach Delay [s/veh]	0.00		0.00		17.59	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.15					
Intersection LOS	C					

Intersection Level Of Service Report
Intersection 7: Project Driveway No. 2 at Central Avenue

Control Type:	Two-way stop	Delay (sec / veh):	14.7
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.098

Intersection Setup

Name	Project Dwy No. 2		Central Ave		Central Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	Project Dwy No. 2		Central Ave		Central Ave	
Base Volume Input [veh/h]	39	19	0	627	625	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	39	19	0	627	625	0
Peak Hour Factor	0.9500	0.9500	1.0000	0.9500	0.9500	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	10	5	0	165	164	0
Total Analysis Volume [veh/h]	41	20	0	660	658	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	Yes		
Number of Storage Spaces in Median	2	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.10	0.03	0.00	0.01	0.01	0.00
d_M, Delay for Movement [s/veh]	14.67	11.50	0.00	0.00	0.00	0.00
Movement LOS	B	B		A	A	
95th-Percentile Queue Length [veh/ln]	0.44	0.44	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	10.88	10.88	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	13.63		0.00		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	0.60					
Intersection LOS	B					

Intersection Level Of Service Report
Intersection 8: Project Driveway No. 3 at Central Avenue

Control Type:	Two-way stop	Delay (sec / veh):	9.3
Analysis Method:	HCM 6th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.034

Intersection Setup

Name	Project Dwy No. 3		Central Ave		Central Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration			┑‖		‖┝	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Project Dwy No. 3		Central Ave		Central Ave	
Base Volume Input [veh/h]	0	0	28	637	625	82
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	28	637	625	82
Peak Hour Factor	1.0000	1.0000	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	7	168	164	22
Total Analysis Volume [veh/h]	0	0	29	671	658	86
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			
Number of Storage Spaces in Median	2	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.03	0.01	0.01	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	9.34	0.00	0.00	0.00
Movement LOS			A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.10	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	0.00	0.00	2.62	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	0.00		0.39		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0.19					
Intersection LOS	A					