Appendix A - Air Quality Assessment

Air Quality Assessment
Victorville Nisqualli Project
City of Victorville, California

Prepared by:

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LIST OF ABBREVIATED TERMS

AQMP	air quality management plan
AB	Assembly Bill
ADT	average daily traffic
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CAAQS	California Ambient Air Quality Standards
CCAA	California Clean Air Act
CalEEMod	California Emissions Estimator Model
CEQA	California Environmental Quality Act
CO	carbon monoxide
cy	cubic yards
DPM	diesel particulate matter
EPA	Environmental Protection Agency
FCAA	Federal Clean Air Act
H_2S	hydrogen sulfide
Pb	lead
LST	local significance threshold
$\mu g/m^3$	micrograms per cubic meter
mg/m^3	milligrams per cubic meter
NAAQS	National Ambient Air Quality Standards
NO_2	nitrogen dioxide
NO_x	nitrogen oxide
O_3	ozone
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
ppm	parts per million
ROG	reactive organic gases
RTP/SCS	Regional Transportation Plan/Sustainable Communities Strategy
SB	Senate Bill
SRA	source receptor area
SCAB	South Coast Air Basin
SCAQMD	South Coast Air Quality Management District
SCAG	Southern California Association of Governments
sf	square foot
SO_{4-2}	sulfates
SO_2	sulfur dioxide
TAC	toxic air contaminant
C_2H_3Cl	vinyl chloride
VOC	volatile organic compound

1 INTRODUCTION

This report documents the results of an Air Quality Assessment completed for the Victorville Nisqualli Project (Project). The purpose of this Air Quality Assessment is to evaluate the potential construction and operational emissions associated with the Project and determine the level of impact the Project would have on the environment.

1.1 Project Location

The proposed Project site is located at the northwest corner of Nisqualli Road and Mariposa Road in the City of Victorville, County of San Bernardino, California. The assessor's parcel numbers (APNs) for the Project site are 3092-311-09 and -10. The Project site is located east of Interstate 15 (I-15), north of Nisqualli Road, and west of Mariposa Road. The Project site is bounded by vacant land to the north, Victorville School District to the south, Victor Valley Christian School & First Assembly of God Church to the east, and I-15 to the west; refer to **Exhibit 1: Regional Location Map** and **Exhibit 2: Project Vicinity Map.**

1.2 Project Description

The Project site is an undeveloped, fully pervious, and vegetated with annual grasses and weeds. The site is 6.03-acres or 262,231 square feet (SF) composed of two APNs. The proposed Project is a standalone development consisting of a new Maverik 9,084-square-foot building containing a convenience/quick service restaurant (QSR) and a QSR with drive thru. The convenience store/QSR without drive thru would be located on western portion of the proposed building. The QSR with drive thru would be located on the eastern portion of the proposed building. The drive thru ingress would begin between the western property line and the west side of the proposed building. The drive thru lane would wrap around the back of the building with an approximate capacity of fourteen vehicles in the queue. The drive thru egress would terminate at the point of sale (POS) located along the eastern portion of the proposed building.

Additionally, the Project would include a fuel station for passenger cars and trucks with accompanying fuel islands and canopies, underground fuel storage tanks, associated fueling appurtenances, recreational vehicle (RV) dump, air compressor, a truck scale, landscaping, concrete, hardscape, and asphalt paving. The associated improvements include, but are not limited to onsite and offsite grading, domestic water service, sanitary sewer service, storm drain infrastructure, street improvements, concrete and asphalt pavement, landscaping, and irrigation. The truck scale would be installed along the northwest property line and the RV dump along the eastern property line, just north of the main entrance; refer to **Exhibit 3: Site Plan.**

The fuel island canopies would be supported by steel frames and columns extending to the foundation system. Twelve fueling islands would be provided. The parking/drive paved areas would utilize both asphalt and concrete pavement. Concrete pavement would be installed in front of the proposed store structure, as well as in the canopy fuel islands and over the underground storage tank area. In other areas, asphalt concrete sections would be used. Traffic is projected to consist mostly of automobiles and light trucks.

Daily routine site activities would consist of customers entering the site to fuel their automobiles or trucks and entering the convenience store for food/snacks or utilizing the proposed drive thru. A covered trash enclosure would be provided along the western property line at the level of the main entrance.

The Project site is designated under the General Plan Land Use Map as (COM) Commercial with a zoning district of (C-2T) General Commercial.

Site Access and Parking

Main ingress and egress to the site is provided via one full-movement driveway (North Driveway) on the eastern property line along Mariposa Road, approximately 350 feet north of Nisqualli Road. A second driveway (South Driveway) is provided on the northeast corner of the site. Pedestrian and ADA access to the Project site is provided on Mariposa Road via a pedestrian designated path of travel traversing the site horizontally and another path of travel on the southwest corner of the site; refer to **Exhibit 3**.

The Project is required to provide a minimum of 32 parking spaces. The Project would provide 42 standard parking spaces inclusive of 2 ADA parking spaces. As shown on **Exhibit 3**, passenger vehicle parking is provided along south west, south, and southeast portions of the site, adjacent to the convenience store and QSR.

Construction

The proposed Project is anticipated to be constructed in one phase. Construction is anticipated to begin in January 2022 with completion of January 2023. The soil cut is anticipated at 15,730 CY, with approximately 1,383 CY of fill and a net of 14,347 CY.

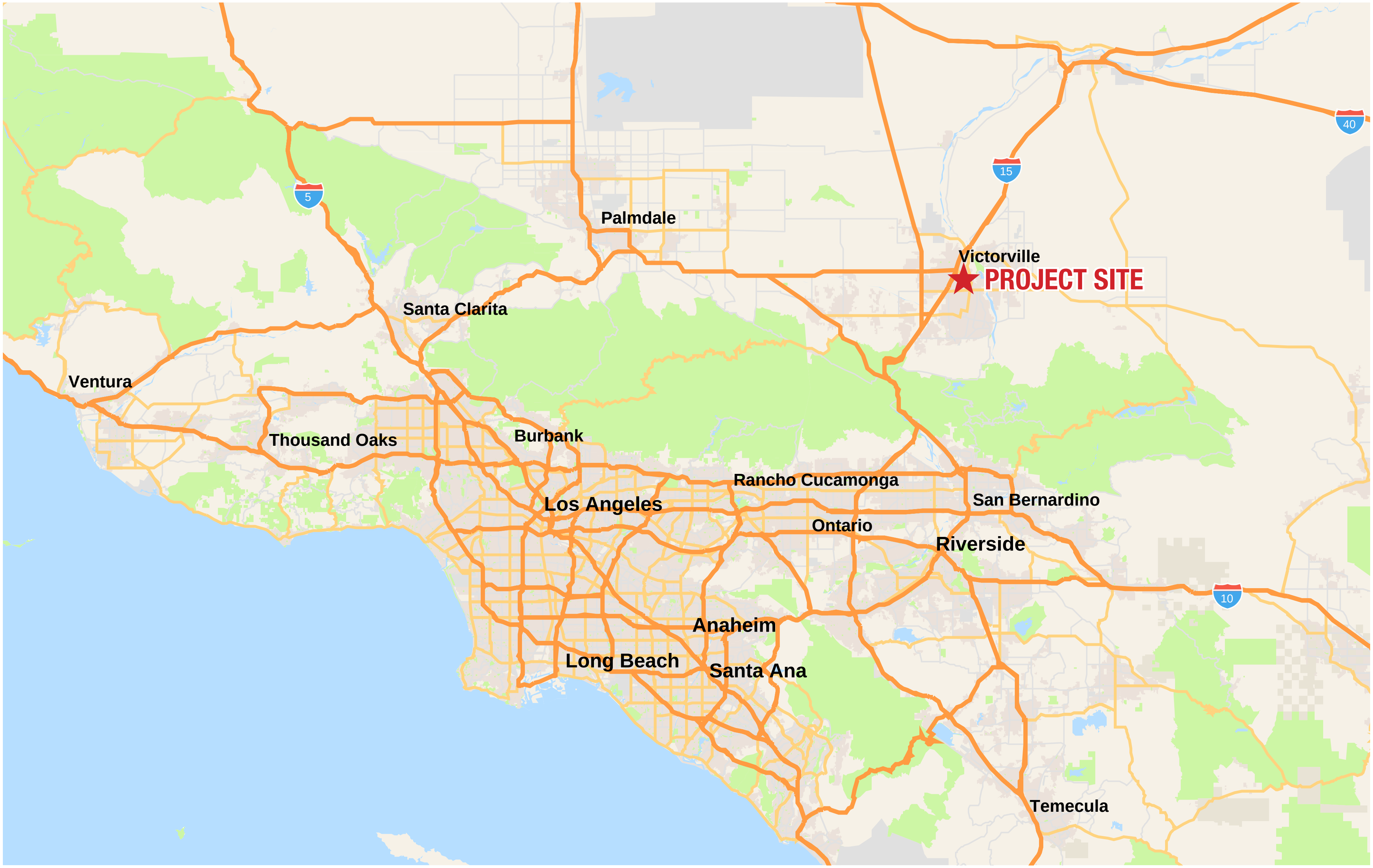

EXHIBIT 1: Regional Location Map
Victorville Nisqualli Gas Station Project
City of Victorville

Not to Scale

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EXHIBIT 2: Project Vicinity Map
Victorville Nisqualli Gas Station Project
City of Victorville

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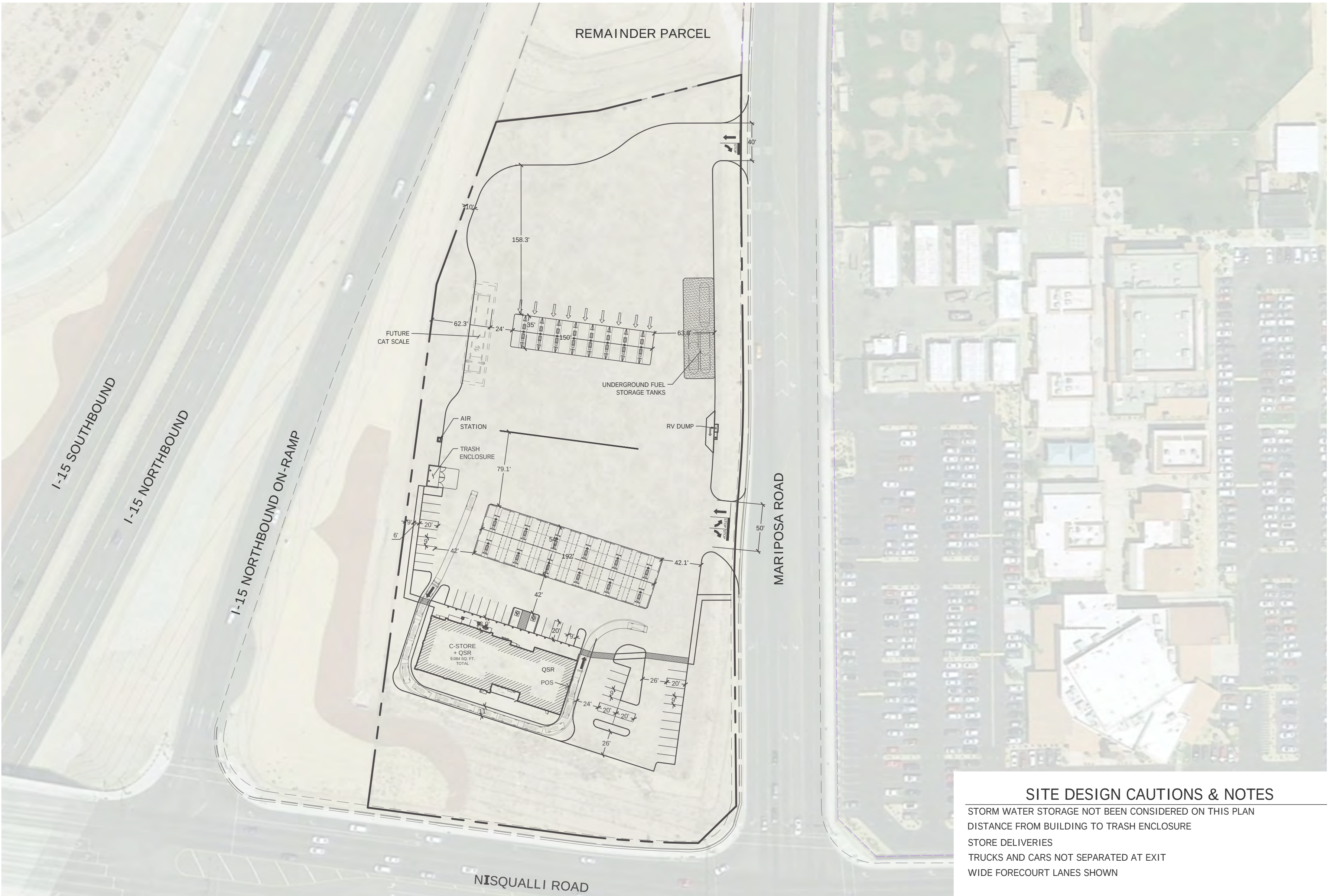

SITE DESIGN CAUTIONS & NOTES

STORM WATER STORAGE NOT BEEN CONSIDERED ON THIS PLAN

DISTANCE FROM BUILDING TO TRASH ENCLOSURE

STORE DELIVERIES

TRUCKS AND CARS NOT SEPARATED AT EXIT

WIDE FORECOURT LANES SHOWN

EXHIBIT 3: Conceptual Site Plan

Victorville Nisqualli Gas Station Project

City of Victorville

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2 ENVIRONMENTAL SETTING

2.1 Climate and Meteorology

The California Air Resources Board (CARB) divides the State into 15 air basins that share similar meteorological and topographical features. The Project is located within the Mojave Desert Air Basin (MDAB), which includes the eastern portion of Kern County, the northeastern portion of Los Angeles County, eastern San Bernardino County, the most eastern portion of Riverside County.

Weather patterns in the area are generally influenced by moderately intense, anticyclonic circulation (associated with high pressure systems). During the summer, a large subtropical high-pressure system off the coast of California keeps the Mojave Desert area sunny and dry. However, the presence of a thermal low-pressure area above the Mojave Desert promotes atmospheric transport from the Los Angeles Basin. During the winter months, the strength of the Pacific high-pressure area wanes, and 20 to 30 frontal systems may pass through the area each year. Some of these frontal systems are sufficiently strong to produce rain in the area. The most substantial large-scale phenomena affecting air quality in the MDAB are the transport winds from the south and the west. These winds are responsible for bringing O3 and other pollutants through the mountain passes from the Los Angeles Basin and the San Joaquin Valley.

Climatic conditions for the MDAB are very arid, with an average annual rainfall of 4.1 inches and no month with an average of more than 1.0 inch. Temperature and precipitation data in the Project area have been recorded at a National Weather Service Station in Daggett since December 1, 1943. The area is characterized by very hot summer temperatures, with the mean maximum temperatures in July and August exceeding 100 degrees Fahrenheit. Winter temperatures are more moderate, with mean maximum temperatures in the 60s and lows in the 30s. Minimum temperatures below freezing (32 degrees Fahrenheit) occur on an average of 30 days per year.

2.2 Air Pollutants of Concern

The air pollutants emitted into the ambient air by stationary and mobile sources are regulated by state and federal laws. These regulated air pollutants are known as “criteria air pollutants” and are categorized into primary and secondary pollutants.

Primary air pollutants are emitted directly from sources. Carbon monoxide (CO), reactive organic gases (ROG), nitrogen oxide (NO_X), sulfur dioxide (SO_2), coarse particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), and lead are primary air pollutants. Of these, CO, NO_X, SO_2, PM_{10}, and $PM_{2.5}$ are criteria pollutants. ROG and NO_X are criteria pollutant precursors and form secondary criteria pollutants through chemical and photochemical reactions in the atmosphere. For example, the criteria pollutant ozone (O_3) is formed by a chemical reaction between ROG and NO_X in the presence of sunlight. O_3 and nitrogen dioxide (NO_2) are the principal secondary pollutants. Sources and health effects commonly associated with criteria pollutants are summarized in **Table 1: Air Contaminants and Associated Public Health Concerns**.

Toxic Air Contaminants

Toxic air contaminants (TACs) are airborne substances that can cause short-term (acute) or long-term (i.e. chronic, carcinogenic or cancer causing) adverse human health effects (i.e. injury or illness). TACs include both organic and inorganic chemical substances. They may be emitted from a variety of common sources including gasoline stations, automobiles, dry cleaners, industrial operations, and painting operations. The current California list of TACs includes more than 200 compounds, including particulate emissions from diesel-fueled engines.

CARB identified diesel particulate matter (DPM) as a toxic air contaminant. DPM differs from other TACs in that it is not a single substance but rather a complex mixture of hundreds of substances. Diesel exhaust is a complex mixture of particles and gases produced when an engine burns diesel fuel. DPM is a concern because it causes lung cancer; many compounds found in diesel exhaust are carcinogenic. DPM includes the particle-phase constituents in diesel exhaust. The chemical composition and particle sizes of DPM vary between different engine types (heavy-duty, light-duty), engine operating conditions (idle, accelerate, decelerate), fuel formulations (high/low sulfur fuel), and the year of the engine. Some short-term (acute) effects of diesel exhaust include eye, nose, throat, and lung irritation, and diesel exhaust can cause coughs, headaches, light-headedness, and nausea. DPM poses the greatest health risk among the TACs. Almost all diesel exhaust particle mass is 10 microns or less in diameter. Due to their extremely small size, these particles can be inhaled and eventually trapped in the bronchial and alveolar regions of the lung.

Table 1: Air Contaminants and Associated Public Health Concerns

Pollutant	Major Man-Made Sources	Human Health Effects
Particulate Matter (PM_{10} and $PM_{2.5}$)	Power plants, steel mills, chemical plants, unpaved roads and parking lots, wood-burning stoves and fireplaces, automobiles and others.	Increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing; asthma; chronic bronchitis; irregular heartbeat; nonfatal heart attacks; and premature death in people with heart or lung disease. Impairs visibility.
Ozone (O_3)	Formed by a chemical reaction between reactive organic gases/volatile organic compounds (ROG or VOC)[1] and nitrogen oxides (NO_X) in the presence of sunlight. Motor vehicle exhaust industrial emissions, gasoline storage and transport, solvents, paints and landfills.	Irritates and causes inflammation of the mucous membranes and lung airways; causes wheezing, coughing, and pain when inhaling deeply; decreases lung capacity; aggravates lung and heart problems. Damages plants; reduces crop yield.
Sulfur Dioxide (SO_2)	A colorless gas formed when fuel containing sulfur is burned and when gasoline is extracted from oil. Examples are petroleum refineries, cement manufacturing, metal processing facilities, locomotives, and ships.	Respiratory irritant. Aggravates lung and heart problems. In the presence of moisture and oxygen, sulfur dioxide converts to sulfuric acid which can damage marble, iron and steel. Damages crops and natural vegetation. Impairs visibility. Precursor to acid rain.
Carbon Monoxide (CO)	An odorless, colorless gas formed when carbon in fuel is not burned completely; a component of motor vehicle exhaust.	Reduces the ability of blood to deliver oxygen to vital tissues, affecting the cardiovascular and nervous system. Impairs vision, causes dizziness, and can lead to unconsciousness or death.
Nitrogen Dioxide (NO_2)	A reddish-brown gas formed during fuel combustion for motor vehicles and industrial sources. Sources include motor vehicles, electric utilities, and other sources that burn fuel.	Respiratory irritant; aggravates lung and heart problems. Precursor to O_3. Contributes to global warming and nutrient overloading which deteriorates water quality. Causes brown discoloration of the atmosphere.

[1] Volatile Organic Compounds (VOCs or Reactive Organic Gases [ROG]) are hydrocarbons/organic gases that are formed solely of hydrogen and carbon. There are several subsets of organic gases including ROGs and VOCs. Both ROGs and VOCs are emitted from the incomplete combustion of hydrocarbons or other carbon-based fuels. The major sources of hydrocarbons are combustion engine exhaust, oil refineries, and oil-fueled power plants; other common sources are petroleum fuels, solvents, dry cleaning solutions, and paint (via evaporation).

Source: California Air Pollution Control Officers Association (CAPCOA), Health Effects, http://www.capcoa.org/health-effects/, Accessed July, 2021.

Ambient Air Quality

CARB monitors ambient air quality at approximately 250 air monitoring stations across the State. These stations usually measure pollutant concentrations ten feet above ground level; therefore, air quality is often referred to in terms of ground-level concentrations. Existing levels of ambient air quality, historical trends, and projections near the Project are documented by measurements made by the Mojave Desert Air Quality Management District (MDAQMD), the air pollution regulatory agency in the MDAB that maintains air quality monitoring stations which process ambient air quality measurements.

Pollutants of concern in the MDAB include O_3 and PM_{10}.[1] The closest air monitoring station to the Project that monitors ambient concentrations of these pollutants is the Victorville-Park Avenue Monitoring Station (located approximately 1.7 miles to the northeast). Local air quality data from 2017 to 2019 are provided in **Table 2: Ambient Air Quality Data**, which lists the monitored maximum concentrations and number of exceedances of state or federal air quality standards for each year.

Table 2: Ambient Air Quality Data

Criteria Pollutant	2017	2018	2019
Ozone (O_3) [1]			
1-hour Maximum Concentration (ppm)	0.088	0.107	00104
8-hour Maximum Concentration (ppm)	0.081	0.096	0.081
Number of Days Standard Exceeded			
CAAQS 1-hour (>0.09 ppm)	0	5	3
NAAQS 8-hour (>0.070 ppm)	17	55	29
Carbon Monoxide (CO) [1]			
1-hour Maximum Concentration (ppm)	1.520	0.729	0.919
Number of Days Standard Exceeded			
NAAQS 1-hour (>35 ppm)	0	0	0
CAAQS 1-hour (>20 ppm)	0	0	0
Nitrogen Dioxide (NO_2) [1]			
1-hour Maximum Concentration (ppm)	0.0573	0.0514	0.056
Number of Days Standard Exceeded			
NAAQS 1-hour (>0.100 ppm)	0	0	0
CAAQS 1-hour (>0.18 ppm)	0	0	0
Particulate Matter Less Than 10 Microns (PM_{10}) [1]			
National 24-hour Maximum Concentration	182.5	165.2	170.0
State 24-hour Maximum Concentration	—	—	—
State Annual Average Concentration (CAAQS=20 μg/m^3)	—	—	—
Number of Days Standard Exceeded			
NAAQS 24-hour (>150 μg/m^3)	1	1	2
CAAQS 24-hour (>50 μg/m^3)	—	—	—
Particulate Matter Less Than 2.5 Microns ($PM_{2.5}$) [1]			
National 24-hour Maximum Concentration	27.2	32.7	17.8
State 24-hour Maximum Concentration	29.3	33.2	20.0
Number of Days Standard Exceeded			
NAAQS 24-hour (>35 μg/m^3)	0	0	0

NAAQS = National Ambient Air Quality Standards; CAAQS = California Ambient Air Quality Standards; ppm = parts per million; μg/m^3 = micrograms per cubic meter; – = not measured

[1] Measurements taken at the Victorville-Park Avenue Monitoring Station at 14306 Park Avenue, Victorville, California (CARB# 36306)

Source: All pollutant measurements are from the CARB Aerometric Data Analysis and Management system database (https://www.arb.ca.gov/adam) except for CO, which were retrieved from the CARB Air Quality and Meteorological Information System (https://www.arb.ca.gov/aqmis2/aqdselect.php).

[1] California Air Resources Board, *Maps of Current State and Federal Area Designations*, Available: https://ww2.arb.ca.gov/resources/documents/maps-state-and-federal-area-designations. Accessed April 2021.

2.3 Sensitive Receptors

Sensitive populations are more susceptible to the effects of air pollution than is the general population. Sensitive receptors that are in proximity to localized sources of toxics are of particular concern. Land uses considered sensitive receptors include residences, schools, playgrounds, childcare centers, long-term health care facilities, rehabilitation centers, convalescent centers, and retirement homes. Sensitive land uses surrounding the Project consist of Victorville Elementary School and Victor Valley Christian School. Sensitive land uses nearest to the Project are shown in **Table 3: Sensitive Receptors**.

Table 3: Sensitive Receptors

Receptor Description	Distance and Direction from the Project
Victor Valley Christian School and First Assembly of God Church	325 feet to the east
Victorville Elementary School	400 feet to the south
Single-Family Residences	750 feet to the northwest
Single-Family Residences	840 feet to the southeast

Source: Google Earth

3 REGULATORY SETTING

3.1 Federal

Federal Clean Air Act

Air quality is federally protected by the Federal Clean Air Act (FCAA) and its amendments. Under the FCAA, the United States Environmental Protection Agency (EPA) developed the primary and secondary National Ambient Air Quality Standards (NAAQS) for the criteria air pollutants including O_3, NO_2, CO, SO_2, PM_{10}, $PM_{2.5}$, and lead. Proposed projects in or near nonattainment areas could be subject to more stringent air-permitting requirements. The FCAA requires each state to prepare a State Implementation Plan to demonstrate how it will attain the NAAQS within the federally imposed deadlines.

The EPA can withhold certain transportation funds from states that fail to comply with the planning requirements of the FCAA. If a state fails to correct these planning deficiencies within two years of Federal notification, the EPA is required to develop a Federal implementation plan for the identified nonattainment area or areas. The provisions of 40 Code of Federal Regulations Parts 51 and 93 apply in all nonattainment and maintenance areas for transportation-related criteria pollutants for which the area is designated nonattainment or has a maintenance plan. The EPA has designated enforcement of air pollution control regulations to the individual states. Applicable federal standards are summarized in **Table 4: State and Federal Ambient Air Quality Standards**.

3.2 State of California

California Air Resources Board

CARB administers the air quality policy in California. The California Ambient Air Quality Standards (CAAQS) were established in 1969 pursuant to the Mulford-Carrell Act. These standards, included with the NAAQS in **Table 4**, are generally more stringent and apply to more pollutants than the NAAQS. In addition to the criteria pollutants, CAAQS have been established for visibility reducing particulates, hydrogen sulfide, and sulfates.

The California Clean Air Act (CCAA), which was approved in 1988, requires that each local air district prepare and maintain an Air Quality Management Plan (AQMP) to achieve compliance with CAAQS. These AQMPs also serve as the basis for the preparation of the State Implementation Plan for meeting federal clean air standards for the State of California. Like the EPA, CARB also designates areas within California as either attainment or nonattainment for each criteria pollutant based on whether the CAAQS have been achieved. Under the CCAA, areas are designated as nonattainment for a pollutant if air quality data shows that a state standard for the pollutant was violated at least once during the previous three calendar years. Exceedances that are affected by highly irregular or infrequent events such as wildfires, volcanoes, etc. are not considered violations of a state standard, and are not used as a basis for designating areas as nonattainment. The applicable State standards are summarized in **Table 4**.

Table 4: State and Federal Ambient Air Quality Standards

Pollutant	Averaging Time	State Standards[1]	Federal Standards[2]
Ozone (O_3) [2, 5, 7]	8 Hour	0.070 ppm (137 µg/m³)	0.070 ppm
	1 Hour	0.09 ppm (180 µg/m³)	NA
Carbon Monoxide (CO)	8 Hour	9.0 ppm (10 mg/m³)	9 ppm (10 mg/m³)
	1 Hour	20 ppm (23 mg/m³)	35 ppm (40 mg/m³)
Nitrogen Dioxide (NO_2)	1 Hour	0.18 ppm (339 µg/m³)	0.10 ppm[11]
	Annual Arithmetic Mean	0.030 ppm (57 µg/m³)	0.053 ppm (100 µg/m³)
Sulfur Dioxide (SO_2) [8]	24 Hour	0.04 ppm (105 µg/m³)	0.14 ppm (365 µg/m³)
	1 Hour	0.25 ppm (655 µg/m³)	0.075 ppm (196 µg/m³)
	Annual Arithmetic Mean	NA	0.03 ppm (80 µg/m³)
Particulate Matter (PM_{10}) [1, 3, 6]	24-Hour	50 µg/m³	150 µg/m³
	Annual Arithmetic Mean	20 µg/m³	NA
Fine Particulate Matter ($PM_{2.5}$) [3, 4, 6, 9]	24-Hour	NA	35 µg/m³
	Annual Arithmetic Mean	12 µg/m³	12 µg/m³
Sulfates (SO_{4-2})	24 Hour	25 µg/m³	NA
Lead (Pb) [10, 11]	30-Day Average	1.5 µg/m³	NA
	Calendar Quarter	NA	1.5 µg/m³
	Rolling 3-Month Average	NA	0.15 µg/m³
Hydrogen Sulfide (H_2S)	1 Hour	0.03 ppm (42 µg/m³)	NA
Vinyl Chloride (C_2H_3Cl) [10]	24 Hour	0.01 ppm (26 µg/m³)	NA

ppm = parts per million; µg/m³ = micrograms per cubic meter; mg/m³ = milligrams per cubic meter; – = no information available.

1 California standards for O_3, carbon monoxide (except Lake Tahoe), sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, suspended particulate matter - PM_{10}, and visibility reducing particles are values that are not to be exceeded. The standards for sulfates, Lake Tahoe carbon monoxide, lead, hydrogen sulfide, and vinyl chloride are not to be equaled or exceeded. If the standard is for a 1-hour, 8-hour or 24-hour average (i.e. all standards except for lead and the PM_{10} annual standard), then some measurements may be excluded. Measurements are excluded that CARB determines would occur less than once per year on the average. The Lake Tahoe carbon monoxide standard is 6.0 ppm, a level one-half the national standard and two-thirds the State standard.

2 National standards shown are the "primary standards" designed to protect public health. National standards other than for O_3, particulates and those based on annual averages are not to be exceeded more than once a year. The 1-hour O_3 standard is attained if, during the most recent three-year period, the average number of days per year with maximum hourly concentrations above the standard is equal to or less than one. The 8-hour O_3 standard is attained when the 3-year average of the 4th highest daily concentrations is 0.070 ppm or less. The 24-hour PM_{10} standard is attained when the 3-year average of the 99th percentile of monitored concentrations is less than 150 $µg/m_3$. The 24-hour $PM_{2.5}$ standard is attained when the 3-year average of 98th percentiles is less than 35 µg/m³.

3 Except for the national particulate standards, annual standards are met if the annual average falls below the standard at every site. The national annual particulate standard for PM_{10} is met if the 3-year average falls below the standard at every site. The annual $PM_{2.5}$ standard is met if the 3-year average of annual averages spatially-averaged across officially designed clusters of sites falls below the standard. NAAQS are set by the EPA at levels determined to be protective of public health with an adequate margin of safety.

4 On October 1, 2015, the national 8-hour O_3 primary and secondary standards were lowered from 0.075 to 0.070 ppm. An area will meet the standard if the fourth-highest maximum daily 8-hour O_3 concentration per year, averaged over three years, is equal to or less than 0.070 ppm. EPA will make recommendations on attainment designations by October 1, 2016, and issue final designations October 1, 2017. Nonattainment areas will have until 2020 to late 2037 to meet the health standard, with attainment dates varying based on the O_3 level in the area.

5 The national 1-hour O_3 standard was revoked by the EPA on June 15, 2005.

6 In June 2002, CARB established new annual standards for $PM_{2.5}$ and PM_{10}.

7 The 8-hour California O_3 standard was approved by the CARB on April 28, 2005 and became effective on May 17, 2006.

8 On June 2, 2010, the EPA established a new 1-hour SO_2 standard, effective August 23, 2010, which is based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. The existing 0.030 ppm annual and 0.14 ppm 24-hour SO_2 NAAQS however must continue to be used until one year following EPA initial designations of the new 1-hour SO_2 NAAQS.

9 In December 2012, EPA strengthened the annual $PM_{2.5}$ NAAQS from 15.0 to 12.0 µg/m³. In December 2014, the EPA issued final area designations for the 2012 primary annual $PM_{2.5}$ NAAQS. Areas designated "unclassifiable/attainment" must continue to take steps to prevent their air quality from deteriorating to unhealthy levels. The effective date of this standard is April 15, 2015.

10 CARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure below which there are no adverse health effects determined.

11 National lead standard, rolling 3-month average: final rule signed October 15, 2008. Final designations effective December 31, 2011.

Source: California Air Resources Board, California Ambient Air Quality Standards, Available at https://ww2.arb.ca.gov/resources/california-ambient-air-quality-standards. Accessed July 2021.

3.3 Regional

Mojave Desert Air Quality Management District

The MDAQMD has jurisdiction over the project component site. The MDAQMD is the air pollution control agency for San Bernardino County's High Desert and Riverside County's Palo Verde Valley. It includes nearly 20,000 square miles and a population of more than 500,000; it is the second largest of California's 35 air districts by area. The MDAQMD has primary responsibility for controlling emissions from stationary sources of air pollution within its jurisdiction. This is accomplished in part by administering air quality programs required by federal and state mandates and enforcing rules and regulations based on air pollution law.

The MDAQMD is responsible for monitoring air quality and for planning, implementing, and enforcing programs designed to attain and maintain NAAQS and CAAQS in the District. In addition, MDAQMD is responsible for establishing stationary source permitting requirements and for ensuring that new, modified, or related stationary sources do not create net emission increases.

The MDAQMD has adopted rules to limit air emissions. Many of these rules were put in place as required measures specified in the various SIPs and air quality plans. This evaluation considered seven MDAQMD rules for regulation of fugitive dust and emissions from fossil fuel combustion. Excerpts of these rules are presented below.

Rule 401: Visible Emissions — A person shall not discharge into the atmosphere from any single source of emission whatsoever any air contaminant for a period or periods aggregating more than three minutes in any one hour which is:

- As dark or darker in shade as that designated No. 1 on the Ringelmann Chart, as published by the United States Bureau of Mines, or

- Of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in subsection (a) of this rule.

Rule 402: Nuisance — A person shall not discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property.

Rule 403: Fugitive Dust

- A person shall not cause or allow the emissions of fugitive dust from any transport, handling, construction or storage activity so that the presence of such dust remains visible in the atmosphere beyond the property line of the emission source. (Does not apply to emissions emanating from unpaved roadways open to public travel or farm roads. This exclusion shall not apply to industrial or commercial facilities).

- A person shall take every reasonable precaution to minimize fugitive dust emissions from wrecking, excavation, grading, clearing of land and solid waste disposal operations.

- A person shall not cause or allow particulate matter to exceed 100 micrograms per cubic meter when determined as the difference between upwind and downwind samples collected on high volume samplers at the property line for a minimum of five hours.

- A person shall take every reasonable precaution to prevent visible particulate matter from being deposited upon public roadways as a direct result of their operations. Reasonable precautions shall include, but are not limited to, the removal of particulate matter from equipment prior to movement on paved streets or the prompt removal of any material from paved streets onto which such material has been deposited.

- Subsections (a) and (c) shall not be applicable when the wind speed instantaneously exceeds 40 kilometers (25 miles) per hour, or when the average wind speed is greater than 24 kilometers (15 miles) per hour. The average wind speed determination shall be on a 15-minute average at the nearest official air-monitoring station or by wind instrument located at the site being checked.

- The provisions of this rule shall not apply to agricultural operations.

Rule 403.2: Fugitive Dust Control for the Mojave Desert Planning Area

Requirements:

- The owner or operator of a source in an affected source category shall comply with the applicable requirements contained in this subsection unless and until the owner or operator has applied for and obtained a District-approved ACP [Alternative PM10 Control Plan] pursuant to section (G).

- The owner or operator of any Construction/Demolition source shall:

  - Use periodic watering for short-term stabilization of Disturbed Surface Area to minimize visible fugitive dust emissions. For purposes of this Rule, use of a water truck to maintain moist disturbed surfaces and actively spread water during visible dusting episodes shall be considered sufficient to maintain compliance;

  - Take actions sufficient to prevent project-related trackout onto paved surfaces;

  - Cover loaded haul vehicles while operating on Publicly Maintained paved surfaces;

  - Stabilize graded site surfaces upon completion of grading when subsequent development is delayed or expected to be delayed more than thirty days, except when such a delay is due to precipitation that dampens the disturbed surface sufficiently to eliminate Visible Fugitive Dust emissions;

  - Clean-up project-related trackout or spills on Publicly Maintained paved surfaces within twenty-four hours; and

  - Reduce non-essential Earth-Moving Activity under High Wind conditions. For purposes of this Rule, a reduction in Earth-Moving Activity when visible dusting occurs from moist and dry surfaces due to wind erosion shall be considered sufficient to maintain compliance.

- The owner/operator of a Construction/Demolition source disturbing 100 or more acres shall, in addition to the provisions of subsection (2):
    - Prepare and submit to the MDAQMD, prior to commencing Earth-Moving Activity, a dust control plan that describes all applicable dust control measures that will be implemented at the project;
    - Provide Stabilized access route(s) to the project site as soon as is feasible. For purposes of this Rule, as soon as is feasible shall mean prior to the completion of Construction/Demolition activity;
    - Maintain natural topography to the extent possible;
    - Construct parking lots and paved roads first, where feasible; and
    - Construct upwind portions of project first, where feasible.
- The Owner or Operator of a site undergoing weed abatement activity shall not:
    - Disrupt the soil crust to the extent that Visible Fugitive Dust is created due to wind erosion.
- Recordkeeping
    - The owner or operator of an affected source shall maintain a Dust Control Plan as required by Sections (C)(3) and (C)(7) on site, or readily accessible, for at least two years after the date of each entry. Such records shall be provided to the District upon request.

Rule 404: Particulate Matter Concentration – A person shall not discharge into the atmosphere from any source, PM except liquid sulfur compounds, in excess of the concentration at standard conditions, shown in Table 404(a). Where the volume discharged is between figures listed in the table, the exact concentration permitted to be discharged shall be determined by linear interpolation.

- The provisions of this rule shall not apply to emissions resulting from the combustion of liquid or gaseous fuels in steam generators or gas turbines.
- For the purposes of this rule, emissions shall be averaged over one complete cycle of operation or one hour, whichever is the lesser time period.

Rule 405: Solid Particulate Matter Weight - A person shall not discharge into the atmosphere from any source, solid particulate matter including lead and lead compounds, in excess of the rate shown in Table 405 (a). Where the process weight per hour is between figures listed in the table, the exact weight of permitted discharge shall be determined by linear interpolation.

- For the purposes of this rule, emissions shall be averaged over one complete cycle of operation or one hour, whichever is the lesser time period.

Rule 409: Combustion Contaminants – A person shall not discharge into the atmosphere from the burning of fuel, combustion contaminants exceeding 0.23 gram per cubic meter (0.1 grain per cubic foot) of gas calculated to 12 percent of carbon dioxide (CO2) at standard conditions averaged over a minimum of 25 consecutive minutes.

The state and federal attainment status designations for the MDAB are summarized in **Table 5: Mojave Desert Air Basin Attainment Status**. The MDAB is currently designated as a nonattainment area with respect to the State O_3, PM_{10} and $PM_{2.5}$ standards, as well as the national O_3 and PM_{10} standards. The MDAB is designated as attainment or unclassified for the remaining state and federal standards.

Table 5: Mojave Desert Air Basin Attainment Status

Pollutant	Averaging Time	State Attainment Status	Federal Attainment Status
Ozone (O_3)	1 Hour	Non-attainment	Non-attainment*
	8 Hour		
Particulate Matter (PM_{10})	24 Hour	Non-attainment	Non-attainment***
	Annual Arithmetic Mean		
Fine Particulate Matter ($PM_{2.5}$)	24 Hour		Unclassified/ Attainment
	Annual Arithmetic Mean	Non-attainment*	
Carbon Monoxide (CO)	8 Hour	Attainment	Unclassified/ Attainment
	1 Hour		
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	Attainment	Unclassified/ Attainment
	1 Hour		
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	Attainment	Unclassified/ Attainment
	24 Hour		
	3 Hour		
	1 Hour		
Lead (Pb)	30 Day Average	Attainment	Unclassified/ Attainment
	Calendar Quarter		
	Rolling 3-Month Average		
Visibility Reducing Particles	8 Hour	Unclassified	No Federal Standards
Sulfates	24 Hour	Attainment	
Hydrogen Sulfide	1 Hour	Non-attainment**	
Vinyl Chloride	24 Hour	Unclassified	

*Southwest corner of desert portion of San Bernardino County only
**Searles Valley (northwest corner of San Bernardino County) only
***San Bernardino County portion only
Mojave Desert Air Quality Management District, MDAQMD Attainment Status, https://www.mdaqmd.ca.gov/home/showpublisheddocument?id=1267

3.4 Local

City of Victorville General Plan

The City of Victorville General Plan represents the community's view of its future and can be thought of as the blueprint for the City's growth and development. The General Plan does not mention specific standalone air quality goals and policies for the City, and it mentions in the Victorville Planning Area, federal and state air quality regulations are monitored by the MDAQMD. Therefore, MDAQMD regulations are the applicable rules to this project.

4 SIGNIFICANCE CRITERIA AND METHODOLOGY

4.1 Air Quality Thresholds

Based upon the criteria derived from Appendix G of the CEQA Guidelines, a Project normally would have a significant effect on the environment if it would:

- Conflict with or obstruct implementation of the applicable air quality plan.
- Result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is in nonattainment under an applicable state or federal ambient air quality standard.
- Expose sensitive receptors to substantial pollutant concentrations.
- Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.
- Exceed MDAQMD Thresholds.

MDAQMD Thresholds

The significance criteria established by SCAQMD may be relied upon to make the above determinations. According to the MDAQMD, an air quality impact is considered significant if a project would violate any NAAQS or CAAQS, contribute substantially to an existing or projected air quality violation, or expose sensitive receptors to substantial pollutant concentrations. The MDAQMD has established thresholds of significance for air quality during construction and operational activities of land use development projects, as shown in **Table 6: Mojave Desert Air Quality Management District Emissions Thresholds**. These mass emissions thresholds are pollutant limits described in pounds per day and tons per year. The project emissions are quantified using CalEEMod software and compared to the MDAQMD's thresholds.

Table 6: Mojave Desert Air Quality Management District Emissions Thresholds

Pollutants	Annual Thresholds (tons)	Daily Thresholds (pounds)
Carbon Monoxide (CO)	100	548
Nitrogen Oxides (NO_X)	25	137
Volatile Organic Compounds (VOC)	25	137
Sulfur Oxides (SO_X)	25	137
Coarse Particulates (PM_{10})	15	82
Fine Particulates ($PM_{2.5}$)	12	65

Source: Mojave Desert Air Quality Management District, MDAQMD CEQA and Federal Conformity Guidelines, 2016.

Carbon Monoxide Hotspots

A CO "hot spot" is a localized concentration of CO that is above the state or federal 1-hour or 8-hour CO ambient air standards. Localized high levels of CO are associated with traffic congestion and idling or slow-moving vehicles. To provide a worst-case scenario, CO concentrations are estimated at project-impacted intersections, where the concentrations would be the greatest.

The USEPA Modeling Guidelines (40 C.F.R. Part 51, Appendix W) explain that a CO exceedance is generally a concern at high volume vehicular intersections in urban areas that operate at level of service (LOS) D or worse and where CO is emitted into partially or completely enclosed spaces such as parking structures and garages. The Guidelines state the following regarding CO models:

> "5.1.a. This section identifies modeling approaches or models appropriate for addressing ozone (O3) a, carbon monoxide (CO), nitrogen dioxide (NO2), particulates (PM–2.5 and PM–10), and lead. These pollutants are often associated with emissions from numerous sources. Generally, mobile sources contribute significantly to emissions of these pollutants or their precursors. For cases where it is of interest to estimate concentrations of CO or NO2 near a single or small group of stationary sources, refer to Section 4. (Modeling approaches for SO2 are discussed in Section 4.)
>
> 5.1.i. Models for assessing the impact of CO emissions are needed for a number of different purposes. Examples include evaluating effects of point sources, congested intersections and highways, as well as the cumulative effect of numerous sources of CO in an urban area.

The CO hotspot analysis uses a screening analysis based on the Project generated traffic volumes to determine if the proposed Project would have the potential to result in localized CO hotspots. CO hot spot thresholds ensure that emissions of CO associated with traffic impacts from a project in combination with CO emissions from existing and forecasted regional traffic do not exceed state or federal standards for CO at any traffic intersection impacted by a project. CO concentrations may be considered substantial if project generated CO concentrations cause a localized violation of the state CO 1-hour standard of 20 ppm, state CO 8-hour standard of 9 ppm, federal CO 1-hour standard of 35 ppm, or federal CO 8-hour standard of 9 ppm. The standards are set to protect the health of sensitive individuals. If the standards are not exceeded, then the sensitive individuals would not be substantially affected.

In addition to the daily thresholds listed above, development associated with the Project would also be subject to the ambient air quality standards. These are addressed though an analysis of localized CO impacts. The significance of localized impacts depends on whether ambient CO levels near the Project are above state and federal CO standards (the more stringent California standards are 20 ppm for 1-hour and 9 ppm for 8-hour). The MDAB has been designated as attainment under the 1-hour and 8-hour standards.

4.2 Methodology

This air quality impact analysis considers construction and operational impacts associated with the Project. Where criteria air pollutant quantification was required, emissions were modeled using the California Emissions Estimator Model (CalEEMod). CalEEMod is a Statewide land use emissions computer model designed to quantify potential criteria pollutant emissions associated with both construction and operations from a variety of land use projects. Air quality impacts were assessed according to methodologies recommended by CARB and the MDAQMD.

Construction equipment, trucks, worker vehicles, and ground-disturbing activities associated with Project construction would generate emissions of criteria air pollutants and precursors. Daily regional construction emissions are estimated by assuming construction occurs at the earliest feasible date (i.e., a conservative estimate of construction activities) and applying off-road, fugitive dust, and on-road emissions factors in CalEEMod.

Project operations would result in emissions of area sources (consumer products), energy sources (natural gas usage), and mobile sources (motor vehicles from Project generated vehicle trips). Project-generated increases in operational emissions would be predominantly associated with motor vehicle use. The increase of traffic over existing conditions as a result of the Project was obtained from the Project's Transportation Study prepared by Kimley-Horn (July 2021). Other operational emissions from area, energy, and stationary sources were quantified in CalEEMod based on land use activity data.

As discussed above, the MDAQMD provides significance thresholds for emissions associated with proposed Project construction and operations. The proposed Project's construction and operational emissions are compared to the daily criteria pollutant emissions significance thresholds in order to determine the significance of a Project's impact on regional air quality.

5 POTENTIAL IMPACTS AND MITIGATION

5.1 Air Quality Analysis

Threshold 5.1	**Would the Project conflict with or obstruct implementation of the applicable air quality plan?**

As part of its enforcement responsibilities, the EPA requires each state with nonattainment areas to prepare and submit a State Implementation Plan that demonstrates the means to attain the federal standards. The State Implementation Plan must integrate federal, state, and local plan components and regulations to identify specific measures to reduce pollution in nonattainment areas, using a combination of performance standards and market-based programs. Similarly, under State law, the CCAA requires an air quality attainment plan to be prepared for areas designated as nonattainment regarding the state and federal ambient air quality standards. Air quality attainment plans outline emissions limits and control measures to achieve and maintain these standards by the earliest practical date.

The Project is located within the MDAB, which is under the jurisdiction of the MDAQMD. The MDAQMD is required, pursuant to the FCAA, to reduce emissions of criteria pollutants for which the MDAB is in nonattainment. The Federal Particulate Matter Attainment Plan and Ozone Attainment Plan for the Mojave Desert set forth a comprehensive set of programs that will lead the MDAB into compliance with federal and state air quality standards. The control measures and related emission reduction estimates within the Federal Particulate Matter Attainment Plan and Ozone Attainment Plan are based upon emissions projections for a future development scenario derived from land use, population, and employment characteristics defined in consultation with local governments. Accordingly, conformance with these attainment plans for development projects is determined by demonstrating compliance with: 1) local land use plans and/or population projections, 2) all MDAQMD Rules and Regulations; and 3) demonstrating that the project will not increase the frequency or severity of a violation in the federal or state ambient air quality standards.

The purpose of the consistency finding is to determine if a project is inconsistent with the assumptions and objectives of the regional air quality plans, and thus if it would interfere with the region's ability to comply with CAAQS and NAAQS.

The Project site is designated under the General Plan Land Use Map as (COM) Commercial with a zoning district of (C-2T) General Commercial. The Project applicant proposes a land use which is consistent with the land use designation. Additionally, it should be noted that the proposed development would not exceed regional thresholds for operational emissions and would therefore be considered to have a less than significant impact. As such, development proposed by the Project is consistent with the growth projections in the General Plan and is therefore considered to be consistent with the AQMP.

As shown in **Table 7** and **Table 8** below, the Project would not exceed the construction standards and net emissions would not exceed operational standards.

Concerning Consistency Criterion No. 2 and 3, the AQMP contains air pollutant reduction strategies based on SCAG's latest growth forecasts, and SCAG's growth forecasts were defined in consultation with local governments and with reference to local general plans. Additionally, the proposed Project would serve existing vehicles in the area and therefore would not exceed the population or job growth projections used by the MDAQMD to develop the AQMP. Thus, the Project is also consistent with the second and third criterion.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

Threshold 5.2	**Would the Project result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is non-attainment under an applicable state or federal ambient air quality standard?**

Construction Emissions

Construction associated with the Project would generate short-term emissions of criteria air pollutants. The criteria pollutants of primary concern within the Project area include O_3-precursor pollutants (i.e. ROG and NO_X) and PM_{10} and $PM_{2.5}$. Construction-generated emissions are short term and of temporary duration, lasting only as long as construction activities occur, but would be considered a significant air quality impact if the volume of pollutants generated exceeds the MDAQMD's thresholds of significance.

Construction results in the temporary generation of emissions resulting from site grading, road paving, motor vehicle exhaust associated with construction equipment and worker trips, and the movement of construction equipment, especially on unpaved surfaces. Emissions of airborne particulate matter are largely dependent on the amount of ground disturbance associated with site preparation activities as well as weather conditions and the appropriate application of water.

The duration of construction activities associated with the Project is estimated to last approximately 12 months. Construction-generated emissions associated the Project were calculated using the CARB-approved CalEEMod computer program, which is designed to model emissions for land use development projects, based on typical construction requirements. See **Appendix A: Air Quality Modeling Data** for more information regarding the construction assumptions used in this analysis. Predicted maximum daily construction-generated emissions for the Project are summarized in **Table 7: Construction-Related Emissions**.

Fugitive dust emissions may have a substantial, temporary impact on local air quality. In addition, fugitive dust may be a nuisance to those living and working in the Project vicinity. Uncontrolled dust from construction can become a nuisance and potential health hazard to those living and working nearby. MDAQMD Rules 401, 402, 403, 403.2, 404, 405, and 409 (prohibition of fugitive dust, nuisances, watering of inactive and perimeter areas, track out requirements, etc.), are applicable to the Project and were applied in CalEEMod to minimize fugitive dust emissions. Standard Condition (SC) AQ-1 requires the implementation of Rule 402 through 409 dust control techniques to minimize PM_{10} and $PM_{2.5}$ concentrations. While impacts would be considered less than significant, Project would be subject to MDAQMD Rules for reducing fugitive dust, described in the Regulatory Framework subsection above and identified in Standard Conditions SC AQ-1.

As shown in **Table 7**, all criteria pollutant emissions would remain below their respective thresholds. While impacts would be considered less than significant, the Project would be subject to MDAQMD

Rules 401 through 405 and Rule 409, described in the Regulatory Framework subsection above and required by SC AQ-1.

Table 7: Construction-Related Emissions (Maximum Pounds Per Day)

Construction Year	Reactive Organic Gases (ROG)	Nitrogen Oxide (NO_x)	Carbon Monoxide (CO)	Sulfur Dioxide (SO_2)	Coarse Particulate Matter (PM_{10})	Fine Particulate Matter ($PM_{2.5}$)
Construction Year 2022	10.90	59.49	39.03	0.14	9.48	5.77
MDAQMD Threshold	*137*	*137*	*548*	*137*	*82*	*65*
Exceed SCAQMD Threshold?	**No**	**No**	**No**	**No**	**No**	**No**
Notes: MDAQMD Rule 403.2 Fugitive Dust Control applied. The Rule 403.2 reduction/credits include the following: properly maintain mobile and other construction equipment; replace ground cover in disturbed areas quickly; water exposed surfaces at least two times daily; cover stockpiles with tarps; and water all haul roads twice daily. Reductions percentages from the SCAQMD CEQA Handbook, Tables XI-A through XI-E (which is derived from WRAP Fugitive Dust Handbook, 2006) were applied. No mitigation was applied to construction equipment. Refer to Appendix A for Model Data Outputs.						
Source: CalEEMod version 2020.4.0. Refer to Appendix A for model outputs.						

Operational Emissions

Project-generated emissions would be primarily associated with motor vehicle use and area sources, such as the use of landscape maintenance equipment and architectural coatings. Long-term operational emissions attributable to the Project are summarized in **Table 8: Long-Term Operational Emissions**. As shown in **Table 8,** the Project emissions would not exceed MDAQMD thresholds.

Table 8: Long-Term Operational Emissions (Maximum Pounds Per Day)

Source	Reactive Organic Gases (ROG)	Nitrogen Oxide (NO_x)	Carbon Monoxide (CO)	Sulfur Dioxide (SO_2)	Coarse Particulate Matter (PM_{10})	Fine Particulate Matter ($PM_{2.5}$)
Unmitigated Operational Emissions						
Area Source Emissions	0.43	< 0.01	0.03	0.00	< 0.01	< 0.01
Energy Emissions	0.03	0.23	0.20	< 0.01	0.02	0.02
Mobile Emissions	5.00	54.80	50.99	0.30	16.10	4.41
Total Emissions	**5.46**	**55.03**	**51.22**	**0.3**	**16.12**	**4.43**
MDAQMD Threshold	*137*	*137*	*548*	*137*	*82*	*65*
Exceeds Threshold?	**No**	**No**	**No**	**No**	**No**	**No**
Source: CalEEMod version 2020.4.0. Note: Total values are from CalEEMod and may not add up 100% due to rounding.						

As noted above, the Project's operational emissions would be associated with mobile sources (i.e., motor vehicle use), energy sources, and area sources. Each of these sources are described below.

- **Area Source Emissions.** Area source emissions would be generated due to on-site equipment, architectural coating, and landscaping that were previously not present on the site.
-
- **Energy Source Emissions.** Energy source emissions would be generated due to electricity and natural gas usage associated with the Project. Primary uses of electricity and natural gas by the Project would be for miscellaneous warehouse equipment, space heating and cooling, water heating, ventilation, lighting, appliances, and electronics.

- **Mobile Sources.** Mobile sources are emissions from motor vehicles, including tailpipe and evaporative emissions. Depending upon the pollutant being discussed, the potential air quality impact may be of either regional or local concern. For example, ROG, NO_X, PM_{10}, and $PM_{2.5}$ are all pollutants of regional concern. NO_X and ROG react with sunlight to form O_3, known as photochemical smog. Additionally, wind currents readily transport PM_{10} and $PM_{2.5}$. However, CO tends to be a localized pollutant, dispersing rapidly at the source.

  Project-generated vehicle emissions are based on the trip generation within the Project's Transportation Study and incorporated into CalEEMod as recommended by the MDAQMD. Per the Project Transportation Study, the Project would generate 2,772 net daily trips (10 percent trucks). As shown in **Table 8**, the anticipated mobile source emissions would not exceed MDAQMD thresholds for criteria pollutants.

Cumulative Effects

The MDAB is designated nonattainment for O_3, PM_{10}, and $PM_{2.5}$ for State standards and nonattainment for O_3 and PM_{10} for Federal standards. The MDAB represents the geographic limit for cumulative air quality since air emissions have a regional effect. On a regional scale, past, present, and foreseeable projects would contribute to increases in vehicle travel associated with long-term growth and worsened air quality. Cumulative growth in population, vehicle use, and industrial activity could inhibit efforts to improve regional air quality and attain the AAQS.

The MDAQMD's thresholds of significance analyze both direct and cumulative impacts. The MDAQMD CEQA and Federal Conformity Guidelines (MDAQMD 2016) state that cumulative impacts are similar to direct and indirect impacts of the project. A given project has a cumulative impact with all other related projects, from the standpoint of each type of impact (cumulative construction emissions, area sources, solvent use, transportation emissions, congestion, etc.). The MDAQMD does not have separate thresholds for cumulative impacts and uses the same significance thresholds for project specific and cumulative impacts for all environmental topics analyzed in an Environmental Assessment or EIR. Projects that exceed the project-specific significance thresholds are considered by the MDAQMD to be cumulatively considerable. This is the reason project-specific and cumulative significance thresholds are the same. Conversely, projects that do not exceed the project-specific thresholds are generally not considered to be cumulatively significant.

The MDAQMD developed the construction and operational thresholds of significance based on the level above which individual project emissions would result in a cumulatively considerable contribution to the MDAB's existing air quality conditions. Therefore, a project that exceeds the MDAQMD construction/operational thresholds would also be a cumulatively considerable contribution to a significant cumulative impact.

As shown in **Table 7** above, Project construction-related emissions by themselves would not exceed the MDAQMD significance thresholds for criteria pollutants. Therefore, the proposed Project would not generate a cumulatively considerable contribution to air pollutant emissions during construction.

As shown in **Table 8** above, Project operational emissions would not exceed MDAQMD thresholds. As a result, operational emissions associated with the Project would not result in a cumulatively considerable contribution to significant cumulative air quality impacts. Additionally, adherence to MDAQMD rules and regulations would alleviate potential impacts related to cumulative conditions on a project-by-project basis. Project operations would not contribute a cumulatively considerable net increase of any nonattainment criteria pollutant.

Standard Conditions and Requirements:

SC AQ-1 Prior to the issuance of grading permits, the City Engineer shall confirm that the Grading Plan, Building Plans and Specifications require all construction contractors to comply with Mojave Desert Air Quality Management District's (MDAQMD's) Rules 401 through 405 and Rule 409 to minimize construction emissions of dust and particulates. The measures include, but are not limited to, the following:

- Use periodic watering for short-term stabilization of Disturbed Surface Area to minimize visible fugitive dust emissions.
- Applicable dust suppressants are inclusive of water, Hygroscopic Materials, or chemical/organic stabilization/suppression materials.
- Cover or otherwise contain Bulk Material carried on haul trucks operating on paved roads.
- Specify other dust control methods as applicable, including physical barriers, speed limit signs, use of vegetation, gravel, and pavement.
- Take actions sufficient to prevent project-related Trackout onto paved surfaces.
- Cleanup project-related Trackout or spills on Publicly Maintained paved surfaces within twenty-four hours.
- Stabilize industrial Unpaved Roads carrying more than ten vehicle trips per day with the majority of those vehicles weighing 30 tons or more.
- Stabilize as much unpaved operations area as is feasible

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

Threshold 5.3 Would the Project expose sensitive receptors to substantial pollutant concentrations?

Sensitive receptors can include uses such as residential communities, long-term health care facilities, schools, rehabilitation centers, childcare centers, and retirement homes. The nearest sensitive receptor is a school and church located approximately 325 feet east of the Project site. Per the MDAQMD CEQA and Federal Conformity Guidelines (August 2016), a gasoline dispersing facility should be at least 300 feet away from the sensitive receptors.

Criteria Pollutant Health Impacts

On December 24, 2018, the California Supreme Court issued an opinion identifying the need to provide sufficient information connecting a project's air emissions to health impacts or explain why such information could not be ascertained (*Sierra Club v. County of Fresno* [Friant Ranch, L.P.] [2018] Cal.5th, Case No. S219783). The federal ambient air quality standards establish the levels of air quality necessary, with an adequate margin of safety, to protect the public health. Therefore, projects that do not exceed the MDAQMD's thresholds would not violate any air quality standards or contribute substantially to an existing or projected air quality violation and no criteria pollutant health impacts.

NO_X and ROG are precursor emissions that form O_3 in the atmosphere in the presence of sunlight where the pollutants undergo complex chemical reactions. It takes time and the influence of meteorological conditions for these reactions to occur, so O_3 may be formed at a distance downwind from the sources. Breathing ground-level O_3 can result health effects that include: reduced lung function, inflammation of airways, throat irritation, pain, burning, or discomfort in the chest when taking a deep breath, chest tightness, wheezing, or shortness of breath. In addition to these effects, evidence from observational studies strongly indicates that higher daily O_3 concentrations are associated with increased asthma attacks, increased hospital admissions, increased daily mortality, and other markers of morbidity. The consistency and coherence of the evidence for effects upon asthmatics suggests that O_3 can make asthma symptoms worse and can increase sensitivity to asthma triggers. In addition, since NO_X emissions also lead to the formation of $PM_{2.5}$, the NO_X reductions needed to meet the O_3 standards will likewise lead to improvement of $PM_{2.5}$ levels and attainment of $PM_{2.5}$ standards.

As previously discussed, Project emissions would be less than significant and would not exceed MDAQMD thresholds (refer to **Table 7** and **Table 8**). The ambient air quality standards establish the levels of air quality necessary, with an adequate margin of safety, to protect public health, including protecting the health of sensitive populations.

Construction-Related Toxic Air Contaminants

Construction would result in the generation of DPM emissions from the use of off-road diesel equipment required. The amount to which the receptors are exposed (a function of concentration and duration of exposure) is the primary factor used to determine health risk (i.e. potential exposure to TAC emission levels that exceed applicable standards). Health-related risks associated with diesel-exhaust emissions are primarily linked to long-term exposure and the associated risk of contracting cancer.

The use of diesel-powered construction equipment would be temporary and episodic. The duration of exposure would be short and exhaust from construction equipment dissipates rapidly. Current models and methodologies for conducting health risk assessments are associated with longer-term exposure periods of 9, 30, and 70 years, which do not correlate well with the temporary and highly variable nature of construction activities. The California Office of Environmental Health Hazard Assessment has not identified short-term health effects from DPM. Construction is temporary and would be transient throughout the site (i.e., move from location to location) and would not generate emissions in a fixed location for extended periods of time which would limit the exposure of any proximate individual sensitive receptor to TACs. Additionally, as noted in **Table 3** above, the closest sensitive receptors to the Project site are located approximately 325 feet away or more.

Additionally, construction is subject to and would comply with California regulations (e.g., California Code of Regulations, Title 13, Sections 2485 and 2449), which reduce diesel PM and criteria pollutant emissions from in-use off-road diesel-fueled vehicles and limit the idling of heavy-duty construction equipment to no more than five minutes. These regulations would further reduce nearby sensitive receptors' exposure to temporary and variable DPM emissions. Given the temporary and intermittent nature of construction activities likely to occur within specific locations in the Project site (i.e., construction is not likely to occur in any one location for an extended time), and the fact that sensitive receptors are approximately 325 feet away or more, the dose of DPM of any one receptor is exposed to would be limited. Therefore, considering the relatively short duration of DPM-emitting construction activity at any one location and the highly dispersive properties of DPM, sensitive receptors would not be exposed to substantial concentrations of construction-related TAC emissions. Impacts would be less than significant.

Operational Toxic Air Contaminants

MDAQMD recommends avoiding siting new sensitive land uses such as residences, schools, daycare centers, playgrounds, or medical facilities within 300 feet of a gasoline dispensing facility. The proposed Project involves the construction of a fuel station for passenger cars and trucks with other amenities (fast food etc.). The closest sensitive receptors to the Project site are located approximately 325 feet away and the closest residences are located 750 feet away or more. As the closest receptor to the Project site is over 300 feet away, a project-specific health risk assessment is not required. Impacts to nearby sensitive receptors would be less than significant.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

Threshold 5.4 Would the Project result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?

The MDAQMD regulates odors through Rule 402 (Nuisance). Rule 402 prohibits the discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property. Typical land uses that generate odors include agriculture (farming and livestock), wastewater treatment plants, food processing plants, chemical plants, composting facilities, refineries, landfills, dairies, and fiberglass molding.

During construction-related activities, some odors (not substantial pollutant concentrations) that may be detected are those typical of construction vehicles (e.g. diesel exhaust from grading and construction equipment). These odors are a temporary short-term impact that is typical of construction projects and would disperse rapidly. The Project would not include any of the land uses that have been identified by the MDAQMD as odor sources. Therefore, the Project would not create objectionable odors.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

6 REFERENCES

1. California Air Pollution Control Officers Association (CAPCOA), *Health Effects*, 2018.
2. California Air Pollution Control Officers Association (CAPCOA), *Health Risk Assessments for Proposed Land Use Projects*, 2009.
3. California Air Resources Board, *Aerometric Data Analysis and Measurement System (ADAM) Top Four Summaries from 2016 to 2018*, 2020.
4. California Air Resources Board, *Air Quality and Land Use Handbook: A Community Health Perspective*, 2005.
5. California Air Resources Board, *Current Air Quality Standards*, 2016.
6. California Air Resources Board, *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles*, 2000.
7. City of Victorville, *City of Victorville General Plan*, 2008
8. Federal Highway Administration*, Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents,* 2016.
9. Kimley-Horn, *Maverik (Nisqualli & Mariposa) Transportation Study*, July 2021.
10. Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program Risk Assessment Guidelines*, 2015.
11. Southern California Association of Governments, *2016 - 2040 Regional Transportation Plan/Sustainable Communities Strategy*, 2016.
12. Mojave Desert Air Quality Management District, *California Environmental Quality Act (CEQA) and Federal Conformity Guidelines*, August 2016.
13. Mojave Desert Air Quality Management District, *Regulation IV-Prohibitions,* Rules 401 through 405 and Rule 409.
14. Mojave Desert Air Quality Management District, *MDAQMD Attainment Status*, Available at: https://www.mdaqmd.ca.gov/home/showpublisheddocument?id=1267. Accessed April 2021.
15. United States Environmental Protection Agency, *National Ambient Air Quality Standards Table*, 2016.
16. United States Environmental Protection Agency, *Nonattainment Areas for Criteria Pollutants*, 2019.
17. United States Environmental Protection Agency, *Policy Assessment for the Review of the Lead National Ambient Air Quality Standards*, 2013.
18. Maverik Inc, Site Plan, *Fit Study Analysis 06*, May 2021.

Appendix A

Air Quality Modeling Data

Victorville Nasqualli - Maverick (CalEEMod)

San Bernardino-Mojave Desert County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Fast Food Restaurant with Drive Thru	2.98	1000sqft	0.07	2,981.00	0
Convenience Market With Gas Pumps	6.10	1000sqft	0.14	6,103.00	0
Gasoline/Service Station	9.00	Pump	0.03	1,270.57	0
Other Asphalt Surfaces	251.78	1000sqft	5.78	251,780.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.6	**Precipitation Freq (Days)**	32
Climate Zone	10			**Operational Year**	2023
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Construction Phase - Anticipated construction schedule

Off-road Equipment - No demolition

Grading -

Vehicle Trips - Per Traffic Study

Fleet Mix - Fleet Mix

Construction Off-road Equipment Mitigation - MDAQMD Rule Compliance

Water Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	CleanPavedRoadPercentReduction	0	6
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	12
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	20.00	60.00
tblConstructionPhase	NumDays	230.00	170.00
tblConstructionPhase	NumDays	20.00	0.00
tblConstructionPhase	NumDays	20.00	50.00
tblConstructionPhase	NumDays	10.00	20.00
tblConstructionPhase	PhaseEndDate	3/24/2023	12/23/2022
tblConstructionPhase	PhaseEndDate	1/27/2023	10/20/2022
tblConstructionPhase	PhaseEndDate	1/28/2022	1/2/2022
tblConstructionPhase	PhaseEndDate	3/11/2022	2/25/2022
tblConstructionPhase	PhaseEndDate	2/24/2023	12/9/2022
tblConstructionPhase	PhaseEndDate	2/11/2022	1/28/2022
tblConstructionPhase	PhaseStartDate	2/25/2023	10/1/2022
tblConstructionPhase	PhaseStartDate	3/12/2022	2/25/2022

tblConstructionPhase	PhaseStartDate	2/12/2022	1/29/2022
tblConstructionPhase	PhaseStartDate	1/28/2023	10/1/2022
tblConstructionPhase	PhaseStartDate	1/29/2022	1/3/2022
tblFleetMix	HHD	0.06	1.00
tblFleetMix	LDA	0.56	0.00
tblFleetMix	LDT1	0.04	0.00
tblFleetMix	LDT2	0.18	0.00
tblFleetMix	LHD1	0.02	0.00
tblFleetMix	LHD2	4.9390e-003	0.00
tblFleetMix	MCY	5.8070e-003	0.00
tblFleetMix	MDV	0.11	0.00
tblFleetMix	MH	8.8400e-004	0.00
tblFleetMix	MHD	0.02	0.00
tblFleetMix	OBUS	1.3640e-003	0.00
tblFleetMix	SBUS	8.0300e-004	0.00
tblFleetMix	UBUS	1.5280e-003	0.00
tblGrading	MaterialExported	0.00	14,347.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblTripsAndVMT	WorkerTripNumber	0.00	15.00
tblVehicleTrips	DV_TP	21.00	0.00
tblVehicleTrips	DV_TP	21.00	0.00
tblVehicleTrips	DV_TP	27.00	0.00
tblVehicleTrips	PB_TP	65.00	0.00
tblVehicleTrips	PB_TP	50.00	0.00
tblVehicleTrips	PB_TP	59.00	0.00

tblVehicleTrips	PR_TP	14.00	100.00
tblVehicleTrips	PR_TP	29.00	100.00
tblVehicleTrips	PR_TP	14.00	100.00
tblVehicleTrips	ST_TR	1,448.33	357.04
tblVehicleTrips	ST_TR	722.03	102.31
tblVehicleTrips	ST_TR	168.56	32.00
tblVehicleTrips	SU_TR	1,182.08	357.04
tblVehicleTrips	SU_TR	542.72	102.31
tblVehicleTrips	SU_TR	168.56	32.00
tblVehicleTrips	WD_TR	845.60	357.04
tblVehicleTrips	WD_TR	496.12	102.31
tblVehicleTrips	WD_TR	168.56	32.00

2.0 Emissions Summary

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	10.9019	59.4869	39.0312	0.1471	18.2141	1.8106	19.8276	9.9699	1.6846	11.4543	0.0000	14,972.6708	14,972.6708	2.0294	0.0000	15,023.4062
Maximum	**10.9019**	**59.4869**	**39.0312**	**0.1471**	**18.2141**	**1.8106**	**19.8276**	**9.9699**	**1.6846**	**11.4543**	**0.0000**	**14,972.6708**	**14,972.6708**	**2.0294**	**0.0000**	**15,023.4062**

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	10.9019	59.4869	39.0312	0.1471	7.8635	1.8106	9.4770	4.2827	1.6846	5.7671	0.0000	14,972.6708	14,972.6708	2.0294	0.0000	15,023.4062
Maximum	**10.9019**	**59.4869**	**39.0312**	**0.1471**	**7.8635**	**1.8106**	**9.4770**	**4.2827**	**1.6846**	**5.7671**	**0.0000**	**14,972.6708**	**14,972.6708**	**2.0294**	**0.0000**	**15,023.4062**

	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**	**56.83**	**0.00**	**52.20**	**57.04**	**0.00**	**49.65**	**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	0.4270	2.5000e-004	0.0276	0.0000		1.0000e-004	1.0000e-004		1.0000e-004	1.0000e-004		0.0591	0.0591	1.5000e-004		0.0629
Energy	0.0257	0.2337	0.1963	1.4000e-003		0.0178	0.0178		0.0178	0.0178		280.4042	280.4042	5.3700e-003	5.1400e-003	282.0705
Mobile	5.0025	54.7985	50.9891	0.2955	15.9625	0.1357	16.0982	4.2831	0.1272	4.4103		30,617.5066	30,617.5066	1.6724		30,659.3154
Total	**5.4552**	**55.0325**	**51.2129**	**0.2969**	**15.9625**	**0.1535**	**16.1160**	**4.2831**	**0.1450**	**4.4282**		**30,897.9698**	**30,897.9698**	**1.6779**	**5.1400e-003**	**30,941.4489**

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	0.4270	2.5000e-004	0.0276	0.0000		1.0000e-004	1.0000e-004		1.0000e-004	1.0000e-004		0.0591	0.0591	1.5000e-004		0.0629
Energy	0.0257	0.2337	0.1963	1.4000e-003		0.0178	0.0178		0.0178	0.0178		280.4042	280.4042	5.3700e-003	5.1400e-003	282.0705
Mobile	5.0025	54.7985	50.9891	0.2955	15.9625	0.1357	16.0982	4.2831	0.1272	4.4103		30,617.5066	30,617.5066	1.6724		30,659.3154
Total	**5.4552**	**55.0325**	**51.2129**	**0.2969**	**15.9625**	**0.1535**	**16.1160**	**4.2831**	**0.1450**	**4.4282**		**30,897.9698**	**30,897.9698**	**1.6779**	**5.1400e-003**	**30,941.4489**

	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	Demolition	Demolition	1/3/2022	1/2/2022	5	0	
2	Site Preparation	Site Preparation	1/3/2022	1/28/2022	5	20	
3	Grading	Grading	1/29/2022	2/25/2022	5	20	
4	Building Construction	Building Construction	2/25/2022	10/20/2022	5	170	
5	Paving	Paving	10/1/2022	12/9/2022	5	50	
6	Architectural Coating	Architectural Coating	10/1/2022	12/23/2022	5	60	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 10

Acres of Paving: 5.78

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 15,532; Non-Residential Outdoor: 5,177; Striped Parking Area: 15,107 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Demolition	Excavators	0	8.00	158	0.38
Demolition	Concrete/Industrial Saws	0	8.00	81	0.73
Grading	Excavators	1	8.00	158	0.38
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Paving	Pavers	2	8.00	130	0.42
Paving	Rollers	2	8.00	80	0.38
Demolition	Rubber Tired Dozers	0	8.00	247	0.40
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Grading	Graders	1	8.00	187	0.41
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Paving	Paving Equipment	2	8.00	132	0.36
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
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
Demolition	0	15.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	7	18.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	6	15.00	0.00	1,793.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	109.00	43.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	22.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Replace Ground Cover

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

Clean Paved Roads

3.2 Demolition - 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	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
Total	**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**

3.2 Demolition - 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	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	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
Total	**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**

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	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
Total	**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**

3.2 Demolition - 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	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	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
Total	**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**

3.3 Site Preparation - 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					18.0663	0.0000	18.0663	9.9307	0.0000	9.9307			0.0000			0.0000
Off-Road	3.1701	33.0835	19.6978	0.0380		1.6126	1.6126		1.4836	1.4836		3,686.0619	3,686.0619	1.1922		3,715.8655
Total	**3.1701**	**33.0835**	**19.6978**	**0.0380**	**18.0663**	**1.6126**	**19.6788**	**9.9307**	**1.4836**	**11.4143**		**3,686.0619**	**3,686.0619**	**1.1922**		**3,715.8655**

3.3 Site Preparation - 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
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
Worker	0.0693	0.0387	0.5207	1.4100e-003	0.1479	9.5000e-004	0.1488	0.0392	8.7000e-004	0.0401		140.4979	140.4979	3.7900e-003		140.5925
Total	**0.0693**	**0.0387**	**0.5207**	**1.4100e-003**	**0.1479**	**9.5000e-004**	**0.1488**	**0.0392**	**8.7000e-004**	**0.0401**		**140.4979**	**140.4979**	**3.7900e-003**		**140.5925**

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					7.7233	0.0000	7.7233	4.2454	0.0000	4.2454			0.0000			0.0000
Off-Road	3.1701	33.0835	19.6978	0.0380		1.6126	1.6126		1.4836	1.4836	0.0000	3,686.0619	3,686.0619	1.1922		3,715.8655
Total	**3.1701**	**33.0835**	**19.6978**	**0.0380**	**7.7233**	**1.6126**	**9.3359**	**4.2454**	**1.4836**	**5.7289**	**0.0000**	**3,686.0619**	**3,686.0619**	**1.1922**		**3,715.8655**

3.3 Site Preparation - 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
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
Worker	0.0693	0.0387	0.5207	1.4100e-003	0.1402	9.5000e-004	0.1411	0.0373	8.7000e-004	0.0382		140.4979	140.4979	3.7900e-003		140.5925
Total	**0.0693**	**0.0387**	**0.5207**	**1.4100e-003**	**0.1402**	**9.5000e-004**	**0.1411**	**0.0373**	**8.7000e-004**	**0.0382**		**140.4979**	**140.4979**	**3.7900e-003**		**140.5925**

3.4 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					6.6531	0.0000	6.6531	3.3828	0.0000	3.3828			0.0000			0.0000
Off-Road	1.9486	20.8551	15.2727	0.0297		0.9409	0.9409		0.8656	0.8656		2,872.0464	2,872.0464	0.9289		2,895.2684
Total	**1.9486**	**20.8551**	**15.2727**	**0.0297**	**6.6531**	**0.9409**	**7.5940**	**3.3828**	**0.8656**	**4.2483**		**2,872.0464**	**2,872.0464**	**0.9289**		**2,895.2684**

3.4 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	0.5036	18.7547	3.0705	0.0689	1.5688	0.0479	1.6168	0.4301	0.0459	0.4760		7,315.6289	7,315.6289	0.3871		7,325.3065
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
Worker	0.0578	0.0322	0.4339	1.1800e-003	0.1232	7.9000e-004	0.1240	0.0327	7.3000e-004	0.0334		117.0816	117.0816	3.1600e-003		117.1604
Total	**0.5613**	**18.7869**	**3.5044**	**0.0700**	**1.6921**	**0.0487**	**1.7408**	**0.4628**	**0.0466**	**0.5094**		**7,432.7105**	**7,432.7105**	**0.3903**		**7,442.4669**

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					2.8442	0.0000	2.8442	1.4461	0.0000	1.4461			0.0000			0.0000
Off-Road	1.9486	20.8551	15.2727	0.0297		0.9409	0.9409		0.8656	0.8656	0.0000	2,872.0464	2,872.0464	0.9289		2,895.2684
Total	**1.9486**	**20.8551**	**15.2727**	**0.0297**	**2.8442**	**0.9409**	**3.7851**	**1.4461**	**0.8656**	**2.3117**	**0.0000**	**2,872.0464**	**2,872.0464**	**0.9289**		**2,895.2684**

3.4 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	0.5036	18.7547	3.0705	0.0689	1.4977	0.0479	1.5457	0.4127	0.0459	0.4585		7,315.628 9	7,315.628 9	0.3871		7,325.306 5
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
Worker	0.0578	0.0322	0.4339	1.1800e-003	0.1168	7.9000e-004	0.1176	0.0311	7.3000e-004	0.0318		117.0816	117.0816	3.1600e-003		117.1604
Total	**0.5613**	**18.7869**	**3.5044**	**0.0700**	**1.6145**	**0.0487**	**1.6632**	**0.4438**	**0.0466**	**0.4903**		**7,432.710 5**	**7,432.710 5**	**0.3903**		**7,442.466 9**

3.5 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		2,554.333 6	2,554.333 6	0.6120		2,569.632 2
Total	**1.7062**	**15.6156**	**16.3634**	**0.0269**		**0.8090**	**0.8090**		**0.7612**	**0.7612**		**2,554.333 6**	**2,554.333 6**	**0.6120**		**2,569.632 2**

3.5 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
Vendor	0.1063	3.9951	0.7375	0.0120	0.2913	6.2900e-003	0.2976	0.0839	6.0100e-003	0.0899		1,262.7877	1,262.7877	0.0754		1,264.6730
Worker	0.4197	0.2342	3.1532	8.5400e-003	0.8954	5.7400e-003	0.9012	0.2375	5.2900e-003	0.2428		850.7926	850.7926	0.0229		851.3658
Total	**0.5259**	**4.2293**	**3.8906**	**0.0205**	**1.1867**	**0.0120**	**1.1987**	**0.3214**	**0.0113**	**0.3327**		**2,113.5804**	**2,113.5804**	**0.0983**		**2,116.0388**

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**

3.5 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
Vendor	0.1063	3.9951	0.7375	0.0120	0.2789	6.2900e-003	0.2851	0.0808	6.0100e-003	0.0868		1,262.7877	1,262.7877	0.0754		1,264.6730
Worker	0.4197	0.2342	3.1532	8.5400e-003	0.8487	5.7400e-003	0.8545	0.2260	5.2900e-003	0.2313		850.7926	850.7926	0.0229		851.3658
Total	**0.5259**	**4.2293**	**3.8906**	**0.0205**	**1.1276**	**0.0120**	**1.1396**	**0.3069**	**0.0113**	**0.3182**		**2,113.5804**	**2,113.5804**	**0.0983**		**2,116.0388**

3.6 Paving - 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	1.1028	11.1249	14.5805	0.0228		0.5679	0.5679		0.5225	0.5225		2,207.6603	2,207.6603	0.7140		2,225.5104
Paving	0.3029					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.4057**	**11.1249**	**14.5805**	**0.0228**		**0.5679**	**0.5679**		**0.5225**	**0.5225**		**2,207.6603**	**2,207.6603**	**0.7140**		**2,225.5104**

3.6 Paving - 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
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
Worker	0.0578	0.0322	0.4339	1.1800e-003	0.1232	7.9000e-004	0.1240	0.0327	7.3000e-004	0.0334		117.0816	117.0816	3.1600e-003		117.1604
Total	**0.0578**	**0.0322**	**0.4339**	**1.1800e-003**	**0.1232**	**7.9000e-004**	**0.1240**	**0.0327**	**7.3000e-004**	**0.0334**		**117.0816**	**117.0816**	**3.1600e-003**		**117.1604**

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	1.1028	11.1249	14.5805	0.0228		0.5679	0.5679		0.5225	0.5225	0.0000	2,207.6603	2,207.6603	0.7140		2,225.5104
Paving	0.3029					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.4057**	**11.1249**	**14.5805**	**0.0228**		**0.5679**	**0.5679**		**0.5225**	**0.5225**	**0.0000**	**2,207.6603**	**2,207.6603**	**0.7140**		**2,225.5104**

3.6 Paving - 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
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
Worker	0.0578	0.0322	0.4339	1.1800e-003	0.1168	7.9000e-004	0.1176	0.0311	7.3000e-004	0.0318		117.0816	117.0816	3.1600e-003		117.1604
Total	**0.0578**	**0.0322**	**0.4339**	**1.1800e-003**	**0.1168**	**7.9000e-004**	**0.1176**	**0.0311**	**7.3000e-004**	**0.0318**		**117.0816**	**117.0816**	**3.1600e-003**		**117.1604**

3.7 Architectural Coating - 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					
Archit. Coating	6.9170					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2045	1.4085	1.8136	2.9700e-003		0.0817	0.0817		0.0817	0.0817		281.4481	281.4481	0.0183		281.9062
Total	**7.1215**	**1.4085**	**1.8136**	**2.9700e-003**		**0.0817**	**0.0817**		**0.0817**	**0.0817**		**281.4481**	**281.4481**	**0.0183**		**281.9062**

3.7 Architectural Coating - 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
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
Worker	0.0847	0.0473	0.6364	1.7200e-003	0.1807	1.1600e-003	0.1819	0.0479	1.0700e-003	0.0490		171.7196	171.7196	4.6300e-003		171.8353
Total	**0.0847**	**0.0473**	**0.6364**	**1.7200e-003**	**0.1807**	**1.1600e-003**	**0.1819**	**0.0479**	**1.0700e-003**	**0.0490**		**171.7196**	**171.7196**	**4.6300e-003**		**171.8353**

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					
Archit. Coating	6.9170					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2045	1.4085	1.8136	2.9700e-003		0.0817	0.0817		0.0817	0.0817	0.0000	281.4481	281.4481	0.0183		281.9062
Total	**7.1215**	**1.4085**	**1.8136**	**2.9700e-003**		**0.0817**	**0.0817**		**0.0817**	**0.0817**	**0.0000**	**281.4481**	**281.4481**	**0.0183**		**281.9062**

3.7 Architectural Coating - 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
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
Worker	0.0847	0.0473	0.6364	1.7200e-003	0.1713	1.1600e-003	0.1725	0.0456	1.0700e-003	0.0467		171.7196	171.7196	4.6300e-003		171.8353
Total	**0.0847**	**0.0473**	**0.6364**	**1.7200e-003**	**0.1713**	**1.1600e-003**	**0.1725**	**0.0456**	**1.0700e-003**	**0.0467**		**171.7196**	**171.7196**	**4.6300e-003**		**171.8353**

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	5.0025	54.7985	50.9891	0.2955	15.9625	0.1357	16.0982	4.2831	0.1272	4.4103		30,617.50 66	30,617.50 66	1.6724		30,659.31 54
Unmitigated	5.0025	54.7985	50.9891	0.2955	15.9625	0.1357	16.0982	4.2831	0.1272	4.4103		30,617.50 66	30,617.50 66	1.6724		30,659.31 54

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Convenience Market With Gas Pumps	2,179.02	2,179.02	2179.02	5,804,039	5,804,039
Fast Food Restaurant with Drive Thru	304.99	304.99	304.99	815,782	815,782
Gasoline/Service Station	288.00	288.00	288.00	769,886	769,886
Other Asphalt Surfaces	0.00	0.00	0.00		
Total	2,772.00	2,772.00	2,772.00	7,389,707	7,389,707

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
Convenience Market With Gas	9.50	7.30	7.30	0.80	80.20	19.00	100	0	0
Fast Food Restaurant with Drive	9.50	7.30	7.30	2.20	78.80	19.00	100	0	0
Gasoline/Service Station	9.50	7.30	7.30	2.00	79.00	19.00	100	0	0
Other Asphalt Surfaces	9.50	7.30	7.30	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
Convenience Market With Gas Pumps	0.555935	0.035798	0.180985	0.113549	0.015175	0.004939	0.018497	0.064736	0.001364	0.001528	0.005807	0.000803	0.000884
Fast Food Restaurant with Drive Thru	0.555935	0.035798	0.180985	0.113549	0.015175	0.004939	0.018497	0.064736	0.001364	0.001528	0.005807	0.000803	0.000884
Gasoline/Service Station	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Other Asphalt Surfaces	0.555935	0.035798	0.180985	0.113549	0.015175	0.004939	0.018497	0.064736	0.001364	0.001528	0.005807	0.000803	0.000884

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	0.0257	0.2337	0.1963	1.4000e-003		0.0178	0.0178		0.0178	0.0178		280.4042	280.4042	5.3700e-003	5.1400e-003	282.0705
NaturalGas Unmitigated	0.0257	0.2337	0.1963	1.4000e-003		0.0178	0.0178		0.0178	0.0178		280.4042	280.4042	5.3700e-003	5.1400e-003	282.0705

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					
Convenience Market With Gas Pumps	37.1196	4.0000e-004	3.6400e-003	3.0600e-003	2.0000e-005		2.8000e-004	2.8000e-004		2.8000e-004	2.8000e-004		4.3670	4.3670	8.0000e-005	8.0000e-005	4.3930
Fast Food Restaurant with Drive Thru	2233.22	0.0241	0.2189	0.1839	1.3100e-003		0.0166	0.0166		0.0166	0.0166		262.7316	262.7316	5.0400e-003	4.8200e-003	264.2928
Gasoline/Service Station	113.098	1.2200e-003	0.0111	9.3100e-003	7.0000e-005		8.4000e-004	8.4000e-004		8.4000e-004	8.4000e-004		13.3057	13.3057	2.6000e-004	2.4000e-004	13.3847
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		**0.0257**	**0.2337**	**0.1963**	**1.4000e-003**		**0.0178**	**0.0178**		**0.0178**	**0.0178**		**280.4042**	**280.4042**	**5.3800e-003**	**5.1400e-003**	**282.0705**

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					
Convenience Market With Gas Pumps	0.0371196	4.0000e-004	3.6400e-003	3.0600e-003	2.0000e-005		2.8000e-004	2.8000e-004		2.8000e-004	2.8000e-004		4.3670	4.3670	8.0000e-005	8.0000e-005	4.3930
Fast Food Restaurant with Drive Thru	2.23322	0.0241	0.2189	0.1839	1.3100e-003		0.0166	0.0166		0.0166	0.0166		262.7316	262.7316	5.0400e-003	4.8200e-003	264.2928
Gasoline/Service Station	0.113098	1.2200e-003	0.0111	9.3100e-003	7.0000e-005		8.4000e-004	8.4000e-004		8.4000e-004	8.4000e-004		13.3057	13.3057	2.6000e-004	2.4000e-004	13.3847
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		**0.0257**	**0.2337**	**0.1963**	**1.4000e-003**		**0.0178**	**0.0178**		**0.0178**	**0.0178**		**280.4042**	**280.4042**	**5.3800e-003**	**5.1400e-003**	**282.0705**

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	0.4270	2.5000e-004	0.0276	0.0000		1.0000e-004	1.0000e-004		1.0000e-004	1.0000e-004		0.0591	0.0591	1.5000e-004		0.0629
Unmitigated	0.4270	2.5000e-004	0.0276	0.0000		1.0000e-004	1.0000e-004		1.0000e-004	1.0000e-004		0.0591	0.0591	1.5000e-004		0.0629

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	0.1137					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.3108					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	2.5500e-003	2.5000e-004	0.0276	0.0000		1.0000e-004	1.0000e-004		1.0000e-004	1.0000e-004		0.0591	0.0591	1.5000e-004		0.0629
Total	**0.4270**	**2.5000e-004**	**0.0276**	**0.0000**		**1.0000e-004**	**1.0000e-004**		**1.0000e-004**	**1.0000e-004**		**0.0591**	**0.0591**	**1.5000e-004**		**0.0629**

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	0.1137					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.3108					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	2.5500e-003	2.5000e-004	0.0276	0.0000		1.0000e-004	1.0000e-004		1.0000e-004	1.0000e-004		0.0591	0.0591	1.5000e-004		0.0629
Total	**0.4270**	**2.5000e-004**	**0.0276**	**0.0000**		**1.0000e-004**	**1.0000e-004**		**1.0000e-004**	**1.0000e-004**		**0.0591**	**0.0591**	**1.5000e-004**		**0.0629**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

Use Water Efficient Irrigation System

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

Victorville Nasqualli - Maverick (CalEEMod)

San Bernardino-Mojave Desert County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Fast Food Restaurant with Drive Thru	2.98	1000sqft	0.07	2,981.00	0
Convenience Market With Gas Pumps	6.10	1000sqft	0.14	6,103.00	0
Gasoline/Service Station	9.00	Pump	0.03	1,270.57	0
Other Asphalt Surfaces	251.78	1000sqft	5.78	251,780.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.6	**Precipitation Freq (Days)**	32
Climate Zone	10			**Operational Year**	2023
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Construction Phase - Anticipated construction schedule

Off-road Equipment - No demolition

Grading -

Vehicle Trips - Per Traffic Study

Fleet Mix - Fleet Mix

Construction Off-road Equipment Mitigation - MDAQMD Rule Compliance

Water Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	CleanPavedRoadPercentReduction	0	6
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	12
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	20.00	60.00
tblConstructionPhase	NumDays	230.00	170.00
tblConstructionPhase	NumDays	20.00	0.00
tblConstructionPhase	NumDays	20.00	50.00
tblConstructionPhase	NumDays	10.00	20.00
tblConstructionPhase	PhaseEndDate	3/24/2023	12/23/2022
tblConstructionPhase	PhaseEndDate	1/27/2023	10/20/2022
tblConstructionPhase	PhaseEndDate	1/28/2022	1/2/2022
tblConstructionPhase	PhaseEndDate	3/11/2022	2/25/2022
tblConstructionPhase	PhaseEndDate	2/24/2023	12/9/2022
tblConstructionPhase	PhaseEndDate	2/11/2022	1/28/2022
tblConstructionPhase	PhaseStartDate	2/25/2023	10/1/2022
tblConstructionPhase	PhaseStartDate	3/12/2022	2/25/2022

tblConstructionPhase	PhaseStartDate	2/12/2022	1/29/2022
tblConstructionPhase	PhaseStartDate	1/28/2023	10/1/2022
tblConstructionPhase	PhaseStartDate	1/29/2022	1/3/2022
tblFleetMix	HHD	0.06	1.00
tblFleetMix	LDA	0.56	0.00
tblFleetMix	LDT1	0.04	0.00
tblFleetMix	LDT2	0.18	0.00
tblFleetMix	LHD1	0.02	0.00
tblFleetMix	LHD2	4.9390e-003	0.00
tblFleetMix	MCY	5.8070e-003	0.00
tblFleetMix	MDV	0.11	0.00
tblFleetMix	MH	8.8400e-004	0.00
tblFleetMix	MHD	0.02	0.00
tblFleetMix	OBUS	1.3640e-003	0.00
tblFleetMix	SBUS	8.0300e-004	0.00
tblFleetMix	UBUS	1.5280e-003	0.00
tblGrading	MaterialExported	0.00	14,347.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblTripsAndVMT	WorkerTripNumber	0.00	15.00
tblVehicleTrips	DV_TP	21.00	0.00
tblVehicleTrips	DV_TP	21.00	0.00
tblVehicleTrips	DV_TP	27.00	0.00
tblVehicleTrips	PB_TP	65.00	0.00
tblVehicleTrips	PB_TP	50.00	0.00
tblVehicleTrips	PB_TP	59.00	0.00

tblVehicleTrips	PR_TP	14.00	100.00
tblVehicleTrips	PR_TP	29.00	100.00
tblVehicleTrips	PR_TP	14.00	100.00
tblVehicleTrips	ST_TR	1,448.33	357.04
tblVehicleTrips	ST_TR	722.03	102.31
tblVehicleTrips	ST_TR	168.56	32.00
tblVehicleTrips	SU_TR	1,182.08	357.04
tblVehicleTrips	SU_TR	542.72	102.31
tblVehicleTrips	SU_TR	168.56	32.00
tblVehicleTrips	WD_TR	845.60	357.04
tblVehicleTrips	WD_TR	496.12	102.31
tblVehicleTrips	WD_TR	168.56	32.00

2.0 Emissions Summary

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	10.8978	59.4897	38.9794	0.1438	18.2141	1.8115	19.8276	9.9699	1.6855	11.4543	0.0000	14,632.3282	14,632.3282	2.0681	0.0000	14,684.0301
Maximum	**10.8978**	**59.4897**	**38.9794**	**0.1438**	**18.2141**	**1.8115**	**19.8276**	**9.9699**	**1.6855**	**11.4543**	**0.0000**	**14,632.3282**	**14,632.3282**	**2.0681**	**0.0000**	**14,684.0301**

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	10.8978	59.4897	38.9794	0.1438	7.8635	1.8115	9.4770	4.2827	1.6855	5.7671	0.0000	14,632.3282	14,632.3282	2.0681	0.0000	14,684.0301
Maximum	**10.8978**	**59.4897**	**38.9794**	**0.1438**	**7.8635**	**1.8115**	**9.4770**	**4.2827**	**1.6855**	**5.7671**	**0.0000**	**14,632.3282**	**14,632.3282**	**2.0681**	**0.0000**	**14,684.0301**

	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**	**56.83**	**0.00**	**52.20**	**57.04**	**0.00**	**49.65**	**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	0.4270	2.5000e-004	0.0276	0.0000		1.0000e-004	1.0000e-004		1.0000e-004	1.0000e-004		0.0591	0.0591	1.5000e-004		0.0629
Energy	0.0257	0.2337	0.1963	1.4000e-003		0.0178	0.0178		0.0178	0.0178		280.4042	280.4042	5.3700e-003	5.1400e-003	282.0705
Mobile	4.4485	54.0551	46.6115	0.2748	15.9625	0.1379	16.1004	4.2831	0.1293	4.4124		28,504.0320	28,504.0320	1.7745		28,548.3947
Total	**4.9012**	**54.2891**	**46.8354**	**0.2762**	**15.9625**	**0.1557**	**16.1182**	**4.2831**	**0.1471**	**4.4303**		**28,784.4952**	**28,784.4952**	**1.7800**	**5.1400e-003**	**28,830.5281**

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	0.4270	2.5000e-004	0.0276	0.0000		1.0000e-004	1.0000e-004		1.0000e-004	1.0000e-004		0.0591	0.0591	1.5000e-004		0.0629
Energy	0.0257	0.2337	0.1963	1.4000e-003		0.0178	0.0178		0.0178	0.0178		280.4042	280.4042	5.3700e-003	5.1400e-003	282.0705
Mobile	4.4485	54.0551	46.6115	0.2748	15.9625	0.1379	16.1004	4.2831	0.1293	4.4124		28,504.0320	28,504.0320	1.7745		28,548.3947
Total	**4.9012**	**54.2891**	**46.8354**	**0.2762**	**15.9625**	**0.1557**	**16.1182**	**4.2831**	**0.1471**	**4.4303**		**28,784.4952**	**28,784.4952**	**1.7800**	**5.1400e-003**	**28,830.5281**

	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	Demolition	Demolition	1/3/2022	1/2/2022	5	0	
2	Site Preparation	Site Preparation	1/3/2022	1/28/2022	5	20	
3	Grading	Grading	1/29/2022	2/25/2022	5	20	
4	Building Construction	Building Construction	2/25/2022	10/20/2022	5	170	
5	Paving	Paving	10/1/2022	12/9/2022	5	50	
6	Architectural Coating	Architectural Coating	10/1/2022	12/23/2022	5	60	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 10

Acres of Paving: 5.78

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 15,532; Non-Residential Outdoor: 5,177; Striped Parking Area: 15,107 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Demolition	Excavators	0	8.00	158	0.38
Demolition	Concrete/Industrial Saws	0	8.00	81	0.73
Grading	Excavators	1	8.00	158	0.38
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Paving	Pavers	2	8.00	130	0.42
Paving	Rollers	2	8.00	80	0.38
Demolition	Rubber Tired Dozers	0	8.00	247	0.40
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Grading	Graders	1	8.00	187	0.41
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Paving	Paving Equipment	2	8.00	132	0.36
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
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
Demolition	0	15.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	7	18.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	6	15.00	0.00	1,793.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	109.00	43.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	22.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Replace Ground Cover

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

Clean Paved Roads

3.2 Demolition - 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	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
Total	**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**

3.2 Demolition - 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	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	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
Total	**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**

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	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
Total	**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**

3.2 Demolition - 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	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	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
Total	**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**

3.3 Site Preparation - 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					18.0663	0.0000	18.0663	9.9307	0.0000	9.9307			0.0000			0.0000
Off-Road	3.1701	33.0835	19.6978	0.0380		1.6126	1.6126		1.4836	1.4836		3,686.0619	3,686.0619	1.1922		3,715.8655
Total	**3.1701**	**33.0835**	**19.6978**	**0.0380**	**18.0663**	**1.6126**	**19.6788**	**9.9307**	**1.4836**	**11.4143**		**3,686.0619**	**3,686.0619**	**1.1922**		**3,715.8655**

3.3 Site Preparation - 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
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
Worker	0.0680	0.0407	0.4326	1.2700e-003	0.1479	9.5000e-004	0.1488	0.0392	8.7000e-004	0.0401		126.1201	126.1201	3.3500e-003		126.2038
Total	**0.0680**	**0.0407**	**0.4326**	**1.2700e-003**	**0.1479**	**9.5000e-004**	**0.1488**	**0.0392**	**8.7000e-004**	**0.0401**		**126.1201**	**126.1201**	**3.3500e-003**		**126.2038**

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					7.7233	0.0000	7.7233	4.2454	0.0000	4.2454			0.0000			0.0000
Off-Road	3.1701	33.0835	19.6978	0.0380		1.6126	1.6126		1.4836	1.4836	0.0000	3,686.0619	3,686.0619	1.1922		3,715.8655
Total	**3.1701**	**33.0835**	**19.6978**	**0.0380**	**7.7233**	**1.6126**	**9.3359**	**4.2454**	**1.4836**	**5.7289**	**0.0000**	**3,686.0619**	**3,686.0619**	**1.1922**		**3,715.8655**

3.3 Site Preparation - 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
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
Worker	0.0680	0.0407	0.4326	1.2700e-003	0.1402	9.5000e-004	0.1411	0.0373	8.7000e-004	0.0382		126.1201	126.1201	3.3500e-003		126.2038
Total	**0.0680**	**0.0407**	**0.4326**	**1.2700e-003**	**0.1402**	**9.5000e-004**	**0.1411**	**0.0373**	**8.7000e-004**	**0.0382**		**126.1201**	**126.1201**	**3.3500e-003**		**126.2038**

3.4 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					6.6531	0.0000	6.6531	3.3828	0.0000	3.3828			0.0000			0.0000
Off-Road	1.9486	20.8551	15.2727	0.0297		0.9409	0.9409		0.8656	0.8656		2,872.0464	2,872.0464	0.9289		2,895.2684
Total	**1.9486**	**20.8551**	**15.2727**	**0.0297**	**6.6531**	**0.9409**	**7.5940**	**3.3828**	**0.8656**	**4.2483**		**2,872.0464**	**2,872.0464**	**0.9289**		**2,895.2684**

3.4 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	0.5267	18.7870	3.5001	0.0670	1.5688	0.0486	1.6175	0.4301	0.0465	0.4766		7,121.8541	7,121.8541	0.4206		7,132.3678
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
Worker	0.0567	0.0339	0.3605	1.0500e-003	0.1232	7.9000e-004	0.1240	0.0327	7.3000e-004	0.0334		105.1001	105.1001	2.7900e-003		105.1698
Total	**0.5833**	**18.8209**	**3.8606**	**0.0681**	**1.6921**	**0.0494**	**1.7415**	**0.4628**	**0.0473**	**0.5101**		**7,226.9542**	**7,226.9542**	**0.4233**		**7,237.5377**

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					2.8442	0.0000	2.8442	1.4461	0.0000	1.4461			0.0000			0.0000
Off-Road	1.9486	20.8551	15.2727	0.0297		0.9409	0.9409		0.8656	0.8656	0.0000	2,872.0464	2,872.0464	0.9289		2,895.2684
Total	**1.9486**	**20.8551**	**15.2727**	**0.0297**	**2.8442**	**0.9409**	**3.7851**	**1.4461**	**0.8656**	**2.3117**	**0.0000**	**2,872.0464**	**2,872.0464**	**0.9289**		**2,895.2684**

3.4 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	0.5267	18.7870	3.5001	0.0670	1.4977	0.0486	1.5464	0.4127	0.0465	0.4592		7,121.854 1	7,121.854 1	0.4206		7,132.367 8
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
Worker	0.0567	0.0339	0.3605	1.0500e-003	0.1168	7.9000e-004	0.1176	0.0311	7.3000e-004	0.0318		105.1001	105.1001	2.7900e-003		105.1698
Total	**0.5833**	**18.8209**	**3.8606**	**0.0681**	**1.6145**	**0.0494**	**1.6639**	**0.4438**	**0.0473**	**0.4910**		**7,226.954 2**	**7,226.954 2**	**0.4233**		**7,237.537 7**

3.5 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		2,554.333 6	2,554.333 6	0.6120		2,569.632 2
Total	**1.7062**	**15.6156**	**16.3634**	**0.0269**		**0.8090**	**0.8090**		**0.7612**	**0.7612**		**2,554.333 6**	**2,554.333 6**	**0.6120**		**2,569.632 2**

3.5 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
Vendor	0.1127	3.9517	0.8633	0.0115	0.2913	6.4600e-003	0.2978	0.0839	6.1800e-003	0.0901		1,215.2670	1,215.2670	0.0836		1,217.3577
Worker	0.4119	0.2463	2.6195	7.6700e-003	0.8954	5.7400e-003	0.9012	0.2375	5.2900e-003	0.2428		763.7270	763.7270	0.0203		764.2342
Total	**0.5246**	**4.1980**	**3.4827**	**0.0192**	**1.1867**	**0.0122**	**1.1989**	**0.3214**	**0.0115**	**0.3328**		**1,978.9941**	**1,978.9941**	**0.1039**		**1,981.5919**

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**

3.5 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
Vendor	0.1127	3.9517	0.8633	0.0115	0.2789	6.4600e-003	0.2853	0.0808	6.1800e-003	0.0870		1,215.2670	1,215.2670	0.0836		1,217.3577
Worker	0.4119	0.2463	2.6195	7.6700e-003	0.8487	5.7400e-003	0.8545	0.2260	5.2900e-003	0.2313		763.7270	763.7270	0.0203		764.2342
Total	**0.5246**	**4.1980**	**3.4827**	**0.0192**	**1.1276**	**0.0122**	**1.1398**	**0.3069**	**0.0115**	**0.3183**		**1,978.9941**	**1,978.9941**	**0.1039**		**1,981.5919**

3.6 Paving - 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	1.1028	11.1249	14.5805	0.0228		0.5679	0.5679		0.5225	0.5225		2,207.6603	2,207.6603	0.7140		2,225.5104
Paving	0.3029					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.4057**	**11.1249**	**14.5805**	**0.0228**		**0.5679**	**0.5679**		**0.5225**	**0.5225**		**2,207.6603**	**2,207.6603**	**0.7140**		**2,225.5104**

3.6 Paving - 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
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
Worker	0.0567	0.0339	0.3605	1.0500e-003	0.1232	7.9000e-004	0.1240	0.0327	7.3000e-004	0.0334		105.1001	105.1001	2.7900e-003		105.1698
Total	**0.0567**	**0.0339**	**0.3605**	**1.0500e-003**	**0.1232**	**7.9000e-004**	**0.1240**	**0.0327**	**7.3000e-004**	**0.0334**		**105.1001**	**105.1001**	**2.7900e-003**		**105.1698**

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	1.1028	11.1249	14.5805	0.0228		0.5679	0.5679		0.5225	0.5225	0.0000	2,207.660 3	2,207.660 3	0.7140		2,225.510 4
Paving	0.3029					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.4057**	**11.1249**	**14.5805**	**0.0228**		**0.5679**	**0.5679**		**0.5225**	**0.5225**	**0.0000**	**2,207.660 3**	**2,207.660 3**	**0.7140**		**2,225.510 4**

3.6 Paving - 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
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
Worker	0.0567	0.0339	0.3605	1.0500e-003	0.1168	7.9000e-004	0.1176	0.0311	7.3000e-004	0.0318		105.1001	105.1001	2.7900e-003		105.1698
Total	**0.0567**	**0.0339**	**0.3605**	**1.0500e-003**	**0.1168**	**7.9000e-004**	**0.1176**	**0.0311**	**7.3000e-004**	**0.0318**		**105.1001**	**105.1001**	**2.7900e-003**		**105.1698**

3.7 Architectural Coating - 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					
Archit. Coating	6.9170					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2045	1.4085	1.8136	2.9700e-003		0.0817	0.0817		0.0817	0.0817		281.4481	281.4481	0.0183		281.9062
Total	**7.1215**	**1.4085**	**1.8136**	**2.9700e-003**		**0.0817**	**0.0817**		**0.0817**	**0.0817**		**281.4481**	**281.4481**	**0.0183**		**281.9062**

3.7 Architectural Coating - 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
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
Worker	0.0831	0.0497	0.5287	1.5500e-003	0.1807	1.1600e-003	0.1819	0.0479	1.0700e-003	0.0490		154.1467	154.1467	4.0900e-003		154.2491
Total	**0.0831**	**0.0497**	**0.5287**	**1.5500e-003**	**0.1807**	**1.1600e-003**	**0.1819**	**0.0479**	**1.0700e-003**	**0.0490**		**154.1467**	**154.1467**	**4.0900e-003**		**154.2491**

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					
Archit. Coating	6.9170					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2045	1.4085	1.8136	2.9700e-003		0.0817	0.0817		0.0817	0.0817	0.0000	281.4481	281.4481	0.0183		281.9062
Total	**7.1215**	**1.4085**	**1.8136**	**2.9700e-003**		**0.0817**	**0.0817**		**0.0817**	**0.0817**	**0.0000**	**281.4481**	**281.4481**	**0.0183**		**281.9062**

3.7 Architectural Coating - 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
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
Worker	0.0831	0.0497	0.5287	1.5500e-003	0.1713	1.1600e-003	0.1725	0.0456	1.0700e-003	0.0467		154.1467	154.1467	4.0900e-003		154.2491
Total	**0.0831**	**0.0497**	**0.5287**	**1.5500e-003**	**0.1713**	**1.1600e-003**	**0.1725**	**0.0456**	**1.0700e-003**	**0.0467**		**154.1467**	**154.1467**	**4.0900e-003**		**154.2491**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Category	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
	lb/day										lb/day					
Mitigated	4.4485	54.0551	46.6115	0.2748	15.9625	0.1379	16.1004	4.2831	0.1293	4.4124		28,504.0320	28,504.0320	1.7745		28,548.3947
Unmitigated	4.4485	54.0551	46.6115	0.2748	15.9625	0.1379	16.1004	4.2831	0.1293	4.4124		28,504.0320	28,504.0320	1.7745		28,548.3947

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Convenience Market With Gas Pumps	2,179.02	2,179.02	2179.02	5,804,039	5,804,039
Fast Food Restaurant with Drive Thru	304.99	304.99	304.99	815,782	815,782
Gasoline/Service Station	288.00	288.00	288.00	769,886	769,886
Other Asphalt Surfaces	0.00	0.00	0.00		
Total	2,772.00	2,772.00	2,772.00	7,389,707	7,389,707

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
Convenience Market With Gas	9.50	7.30	7.30	0.80	80.20	19.00	100	0	0
Fast Food Restaurant with Drive	9.50	7.30	7.30	2.20	78.80	19.00	100	0	0
Gasoline/Service Station	9.50	7.30	7.30	2.00	79.00	19.00	100	0	0
Other Asphalt Surfaces	9.50	7.30	7.30	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
Convenience Market With Gas Pumps	0.555935	0.035798	0.180985	0.113549	0.015175	0.004939	0.018497	0.064736	0.001364	0.001528	0.005807	0.000803	0.000884
Fast Food Restaurant with Drive Thru	0.555935	0.035798	0.180985	0.113549	0.015175	0.004939	0.018497	0.064736	0.001364	0.001528	0.005807	0.000803	0.000884
Gasoline/Service Station	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Other Asphalt Surfaces	0.555935	0.035798	0.180985	0.113549	0.015175	0.004939	0.018497	0.064736	0.001364	0.001528	0.005807	0.000803	0.000884

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	0.0257	0.2337	0.1963	1.4000e-003		0.0178	0.0178		0.0178	0.0178		280.4042	280.4042	5.3700e-003	5.1400e-003	282.0705
NaturalGas Unmitigated	0.0257	0.2337	0.1963	1.4000e-003		0.0178	0.0178		0.0178	0.0178		280.4042	280.4042	5.3700e-003	5.1400e-003	282.0705

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					
Convenience Market With Gas Pumps	37.1196	4.0000e-004	3.6400e-003	3.0600e-003	2.0000e-005		2.8000e-004	2.8000e-004		2.8000e-004	2.8000e-004		4.3670	4.3670	8.0000e-005	8.0000e-005	4.3930
Fast Food Restaurant with Drive Thru	2233.22	0.0241	0.2189	0.1839	1.3100e-003		0.0166	0.0166		0.0166	0.0166		262.7316	262.7316	5.0400e-003	4.8200e-003	264.2928
Gasoline/Service Station	113.098	1.2200e-003	0.0111	9.3100e-003	7.0000e-005		8.4000e-004	8.4000e-004		8.4000e-004	8.4000e-004		13.3057	13.3057	2.6000e-004	2.4000e-004	13.3847
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		**0.0257**	**0.2337**	**0.1963**	**1.4000e-003**		**0.0178**	**0.0178**		**0.0178**	**0.0178**		**280.4042**	**280.4042**	**5.3800e-003**	**5.1400e-003**	**282.0705**

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					
Convenience Market With Gas Pumps	0.0371196	4.0000e-004	3.6400e-003	3.0600e-003	2.0000e-005		2.8000e-004	2.8000e-004		2.8000e-004	2.8000e-004		4.3670	4.3670	8.0000e-005	8.0000e-005	4.3930
Fast Food Restaurant with Drive Thru	2.23322	0.0241	0.2189	0.1839	1.3100e-003		0.0166	0.0166		0.0166	0.0166		262.7316	262.7316	5.0400e-003	4.8200e-003	264.2928
Gasoline/Service Station	0.113098	1.2200e-003	0.0111	9.3100e-003	7.0000e-005		8.4000e-004	8.4000e-004		8.4000e-004	8.4000e-004		13.3057	13.3057	2.6000e-004	2.4000e-004	13.3847
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		**0.0257**	**0.2337**	**0.1963**	**1.4000e-003**		**0.0178**	**0.0178**		**0.0178**	**0.0178**		**280.4042**	**280.4042**	**5.3800e-003**	**5.1400e-003**	**282.0705**

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	0.4270	2.5000e-004	0.0276	0.0000		1.0000e-004	1.0000e-004		1.0000e-004	1.0000e-004		0.0591	0.0591	1.5000e-004		0.0629
Unmitigated	0.4270	2.5000e-004	0.0276	0.0000		1.0000e-004	1.0000e-004		1.0000e-004	1.0000e-004		0.0591	0.0591	1.5000e-004		0.0629

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	0.1137					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.3108					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	2.5500e-003	2.5000e-004	0.0276	0.0000		1.0000e-004	1.0000e-004		1.0000e-004	1.0000e-004		0.0591	0.0591	1.5000e-004		0.0629
Total	**0.4270**	**2.5000e-004**	**0.0276**	**0.0000**		**1.0000e-004**	**1.0000e-004**		**1.0000e-004**	**1.0000e-004**		**0.0591**	**0.0591**	**1.5000e-004**		**0.0629**

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	0.1137					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.3108					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	2.5500e-003	2.5000e-004	0.0276	0.0000		1.0000e-004	1.0000e-004		1.0000e-004	1.0000e-004		0.0591	0.0591	1.5000e-004		0.0629
Total	**0.4270**	**2.5000e-004**	**0.0276**	**0.0000**		**1.0000e-004**	**1.0000e-004**		**1.0000e-004**	**1.0000e-004**		**0.0591**	**0.0591**	**1.5000e-004**		**0.0629**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

Use Water Efficient Irrigation System

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

Appendix B – Biological Resources Assessment and Jurisdictional Delineation

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47 1st Street, Suite 1
Redlands, CA 92373-4601
(909) 915-5900

March 11, 2021

Kari Cano
Kimley-Horn
3880 Lemon Street, Suite 420
Riverside, CA 92501

RE: Biological Resource Assessment & Jurisdictional Delineation
Assessor's Parcel Number 3092-311-09
Maverik Fuel Center and Convenience Stores Project
City of Victorville, CA

Dear Ms. Cano,

Jericho Systems, Inc. (Jericho) is pleased to provide Kimley-Horn with this biological resources assessment (BRA) and jurisdictional delineation (JD) for the proposed Maverik Fuel Center and Convenience Stores Project (Project) located in the City of Victorville, County of San Bernardino, on the northwest corner of Mariposa Road and Nasqualli Road. It is located on the *Hesperia* USGS Quad, within Township 5N, Range 4W, Section 30 and is identified as Assessor's Parcel Number (APN) 3092-311-09, totaling 8.69 acres (Figures 1-3). Of the 8.69 acre parcel, 4.79 acres is slated to be developed. For the purposes of the biological resources, the survey area will be the entire parcel of 8.69 acres. See Site Plan overlay (Figure 4).

This report addresses potential project-related effects to 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 the California Endangered Species Act (CESA), or species designated as sensitive by the California Department of Fish and Wildlife (CDFW), or the California Native Plant Society (CNPS). Attention was focused on sensitive biological resources known to occur locally, within a 2-mile radius of the Project site boundaries (Figure 5).

Attention was focused on those State- and/or federally-listed as threatened or endangered species as well as species of special concern that have been documented in the project vicinity including the State- and federally-listed as threatened desert tortoise (*Gopherus agassizii*) [DT] the State-listed as threatened Mohave ground squirrel (*Xerospermophilus mohavensis*) [MGS] and western burrowing owl (*Athene cunicularia hypugaea*) [BUOW] which is a State and federal Species of Special Concern (SSC) and the western Joshua Tree, which was listed by the CDFW as a candidate threatened species in October 2020.

This report also addresses resources protected under the Migratory Bird Treaty Act, federal Clean Water Act (CWA) regulated by the U.S. Army Corps of Engineers (USACE) and Regional Water Quality Control Board (RWQCB) respectively; Porter-Cologne Act regulated by the RWQCB and Section 1602 of the California Fish and Game Code (FCG) administered by the CDFW.

ENVIRONMENTAL SETTING

The Project site is situated in Victor Valley which is located in the southwestern portion of the high desert in the County of San Bernardino within the Mojave Basin and Range Ecoregion. An Ecoregion is a regional area that has similar ecosystems in terms of type, quality, and quantity of environmental resources. The Mojave Basin and Range Ecoregion consists of broad basins and scattered mountains that are relatively low, warm, and dry. Creosote bush, white bursage, Joshua tree and other yuccas, and blackbrush are typical in the basin are and at the higher elevations, sagebrush, juniper, and single leaf pinyon are typical.

Hydrologically, the Project site is located within the Upper Mojave Hydrologic Sub-Area (HSA 628.20) which comprises a 556,821-acre drainage area within the larger Mojave Area Watershed (HUC 8). The Mojave River is the major hydrogeomorphic feature within the Mojave Area.

The climate and environment of the local area is typical of southern California "high desert" country, so-called because of its higher elevation than the Colorado Desert to the southeast. The climate is marked by extremes in temperature and aridity, with summer highs reaching well over 110ºF and winter lows dipping below freezing. Average annual precipitation is less than 5 inches.

METHODS

As stated above, the objective of this document is to determine whether the Project site supports special status or otherwise sensitive species and/ or their habitat, and to address the potential effects associated with the Project on those resources. The species and habitats addressed in this document are based on database information and field investigation.

Prior to conducting the field study, species and habitat information was gathered from the reports related to the specific project and relevant databases for the *Hesperia* USGS 7.5 minute series quadrangle to determine which species and/or habitats would be expected to occur on site. These sources include:

- U.S. Fish and Wildlife (USFWS) threatened and endangered species occurrence GIS overlay;
- USFWS Information for Planning and Consultation System (IPaC);
- California Natural Diversity Database (CNDDB) *Rarefind 5*);
- CNDDB Biogeographic Information and Observation System (BIOS);
- California Native Plant Society Electronic Inventory (CNPSEI) database;
- Calflora Database;
- USDA Natural Resources Conservation Service (NRCS) Web Soil Survey;
- USFWS National Wetland Inventory;
- Environmental Protection Agency (EPA) Water Program "My Waters" data layers
- USFWS Designated Critical Habitat Maps
- Mohave Ground squirrel Range maps

Jericho Biologist Shay Lawrey, conducted a general biological resources assessment on January 24, 2021, with an emphasis on special-status species known to occur in the vicinity of the Project site. Ms. Lawrey has advanced degrees and multiple years of experience surveying biological resources within Southern California. Ms. Lawrey conducted the systematic and comprehensive survey during calm weather, between the hours of 6 a.m. and 9:00 a.m. Weather conditions during the survey consisted of partly cloudy skies with temperatures ranging from 48 degrees Fahrenheit (°F) to 59° F and winds at 10 mph.

Ms. Lawrey walked transects spaced approximately 30 feet apart to provide 100 visual coverage of the ground surface. The 200-foot buffer area survey was surveyed using binoculars. Wildlife species were detected during field surveys by sight, calls, tracks, scat, or other sign. In addition to species observed, expected wildlife usage of the site was determined per known habitat preferences of regional wildlife species and knowledge of their relative distributions in the area. The focus of the faunal species surveys was to identify potential habitat for special status wildlife within the project area. Disturbance characteristics and all animal sign encountered on the site are recorded in the results section.

During the site survey, Ms. Lawrey examined natural and non-natural substrates for burrows to determine size, shape, and aspect for suitability for burrowing owl (BUOW) or other fossorial species and to see if any BUOW sign (molted feathers, cast pellets, prey remains, and owl whitewash) were present.

Ms. Lawrey also evaluated the Project site for the presence of jurisdictional waters, i.e. Clean Water Act (CWA) waters of the U.S.(WoUS) as regulated by the USACE and RWQCB, and California Fish and Game Code (FGC) streambed waters and associated riparian habitat as regulated by the CDFW. Evaluation of potential non-wetland WoUS at the Ordinary High Water Mark (OHWM) in variable, ephemeral, intermittent, or perennial non-wetland waters followed guidance described in A Field Guide to the Identification of the Ordinary High Water Mark in the Arid West Region of the Western United States (Lichvar and McColley 2008) and evaluation of potential State jurisdiction followed guidance in the Fish and Game Code and A Review of Stream Processes and Forms in Dryland Watersheds (CDFW, 2010) and MESA Field Guide, Mapping Episodic Stream Activity (2011) which look at the "maximum expression" on the landscape, often including the entire floodplain of a river and stream system.

RESULTS

Habitat

The Project site is surrounded by high-traffic roads and Highway. It is bordered by Interstate 15 to the west and north, Nisqualli Road to the south, and Mariposa Road to the east.

Soils within the Project site consist entirely of Cajon Sand, 0 to 2 Percent Slopes (Figure 6) and have been compacted as a result of frequent weed abatement.

The Project site is entirely disturbed and is mostly denuded with patchily distributed creosote bush (*Larrea tridentata*), sticky lessingia (*Lessingia glandulifera*), and rubber rabbitbrush (*Ericameria nauseosa*). Non-native grasses dominate the Project site and consist of schizmus (*Shizmus* spp.) and bromus grasses (*Bromus* sp). Refer to site photos located at the end of the document for reference of habitat present on site. Joshua trees and other cactus species are absent from the site.

Wildlife

Wildlife species observed were limited to birds only which included common raven (*Corvus corax*), house sparrow (*Passer domesticus*), lesser goldfinch (*Spinus psaltria*), and house finch (*Spinus psaltria*).

Special Status Species and Habitats

Table 1, located at the end of the document, represents a compiled list of results from the IPaC, CNDDB and CNPSEI databases of species which have been documented within 2 miles of the Project site and/or have the potential to occur based potentially suitable habitat adjacent to, or within, the Project site. Table 1 also provides a potential to occur assessment based on the field investigation and surveyor's knowledge of the species and local ecology and considers the habitat requirements for each species and the potential for their occurrence on the site, based on required habitat elements relative to the current site conditions and species' range.

This list of sensitive species includes any State- and/or federally listed threatened or endangered 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.

No State- and/or federally listed threatened or endangered species, USFWS-designated Critical Habitats, or other sensitive species were observed on site during the field surveys. There are no undisturbed areas on site or in the vicinity. Therefore, there is no potential for MGS or DT to occur on site. Further investigation is not warranted or recommended.

Burrowing owl

According to the databases, BUOW is the only sensitive species documented to occur within a 2 mile radius of the Project site. The western BUOW is one of 18 New World Burrowing Owl subspecies, and one of only two in North America. The western BUOW ranges from Texas to California and north to southern Canada. Individuals of resident populations in southern California, northern Mexico, and Florida breed and overwinter in an area without a significant migration (Haug et al. 1993). BUOW are found across American open landscapes, showing activity chiefly in the daytime. In California, preferred habitat is generally typified by short, sparse vegetation with few shrubs, level to gentle topography and well-drained soils. In addition, BUOW may occur in some agricultural areas, ruderal grassy fields, vacant lots and pastures, and flood control facilities if the surrounding vegetation structure is suitable and there are useable burrows and foraging habitat in proximity.

The BUOW requires underground burrows or other cavities for nesting during the breeding season and for roosting and cover, year-round. Burrows used by the owls are usually dug by other species termed host burrowers. In California, California ground squirrel (*Spermophilus beecheyi*) and round-tailed ground squirrel (*Citellus tereticaudus*) burrows are frequently used by BUOW but they may use dens or holes dug by other fossorial species and/or human made structures such as cement culverts and pipes. They are active during the day and night and are generally observed in the early morning hours or at twilight.

BUOW have a high fidelity to their birth territory and they often prefer nesting in areas of high burrow densities. Breeding pairs are easily located within the surrounding of their nests (usually 90 feet) due to their territorial behavior. BUOW breeding season begins February 1 and extends to August 31. Pair formation can begin in February. Peak of the BUOW breeding season, commonly accepted in California, occurs between April 15 and July 15. April to mid-May is when most burrowing owls are in the egg laying and incubation stages. BUOW egg incubation period is about 27-28 days Chick rearing typically occurs between May 15 and July 1. July 15 is typically considered the late nestling period when most owls are spending time above ground. The non-breeding season is September 1 to January 31. BUOW are semi-colonial and will sometimes share a burrow for incubation and chick rearing.

The BUOW is not listed under the State or federal ESA but is considered both a State and federal SSC. 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 Fish and Game Code (CDFG Code #3513 & #3503.5).

> *Findings*: Per 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.
>
> The result of the survey was that no evidence of BUOW were found in the survey area. No surrogate burrows were found and no ground squirrels or rabbits occur on site. No BUOW individuals or sign including pellets, feathers or whitewash were observed.

Nesting Birds

The federal Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C 703-711) provides protection for nesting birds that are both residents and migrants whether they are considered sensitive by resource agencies. The MBTA makes it unlawful to take, possess, buy, sell, purchase, or barter any migratory bird listed under 50 CFR 10, including feathers or other parts, nests, eggs, or products, except as allowed by implementing regulations (50 CFR 21). The direct injury or death of a migratory bird, due to construction activities or other construction-related disturbance that causes nest abandonment, nestling abandonment, or forced fledging would be considered a take under federal law. The USFWS, in coordination with the CDFW administers the MBTA. CDFW's authoritative nexus to MBTA is provided in FGC Sections 3503.5 which protects all birds of prey and their nests and FGC Section 3800 which protects all non-game birds that occur naturally in the State.

> *Findings*: Vegetation suitable for nesting birds does exist within and adjacent to the Project site. Most birds are protected by the MBTA. 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 January/February to August/September or conducting pre-construction nesting bird surveys.

Jurisdictional Waters

A street runoff storm drain is located on the southwest corner of the Project site. This feature is a man-made feature that is not subject to the federal CWA, State FGC or Porter Cologne act. Further, the project design will not impact this street storm drain.

CONCLUSIONS AND RECOMMENDATIONS

The proposed Project will not affect State or federally listed endangered, threatened species. High traffic roadways surround the Project site and no evidence of State or federally listed endangered, threatened species or otherwise sensitive species was found during survey. In addition, the proposed Project will not adversely affect Critical Habitat as none exist within the Project area.

Vegetation bordering Project facility areas has the potential to support nesting birds and migratory birds protected under the MBTA.

The following general best management practices are recommended to avoid and or minimize potential impacts:

General Best Management Practices

> Recommendation: Bird nesting season generally extends from February 1 through September 15 in southern California and specifically, April 15 through August 31 for migratory passerine birds. To avoid impacts to nesting birds (common and special status) during the nesting season, a qualified Avian Biologist will conduct pre-construction Nesting Bird Surveys (NBS) within three days prior to project-related disturbance to nestable vegetation to identify any active nests. If no active nests are found, no further action will be required. If an active nest is found, the biologist will set appropriate no-work buffers around the nest which will be based upon the nesting species, its sensitivity to disturbance, nesting stage and expected types, intensity, and duration of disturbance. The nests and buffer zones shall be field checked as necessary by a qualified biological monitor. The approved no-work buffer zone shall be clearly marked in the field, within which no disturbance activity shall commence until the qualified biologist has determined the young birds have successfully fledged and the nest is inactive.

Should you have any questions or require further information, please contact me at (909) 915-5900 or shay@jericho-systems.com should you have any questions or require further information.

Sincerely,

Shay Lawrey

Shay Lawrey, President

Attachments:

A. Photos
B. Figures
C. Table 1: Sensitive Species Potential to Occur

0 0.0175 0.035 0.07 0.105 0.14 Miles

1 inch = 219 feet

Imagery Date: 5/31/2019

Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,

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N

Photo Map	Maverik Fuel Station Victorville, CA

Photo 1

Photo 2.

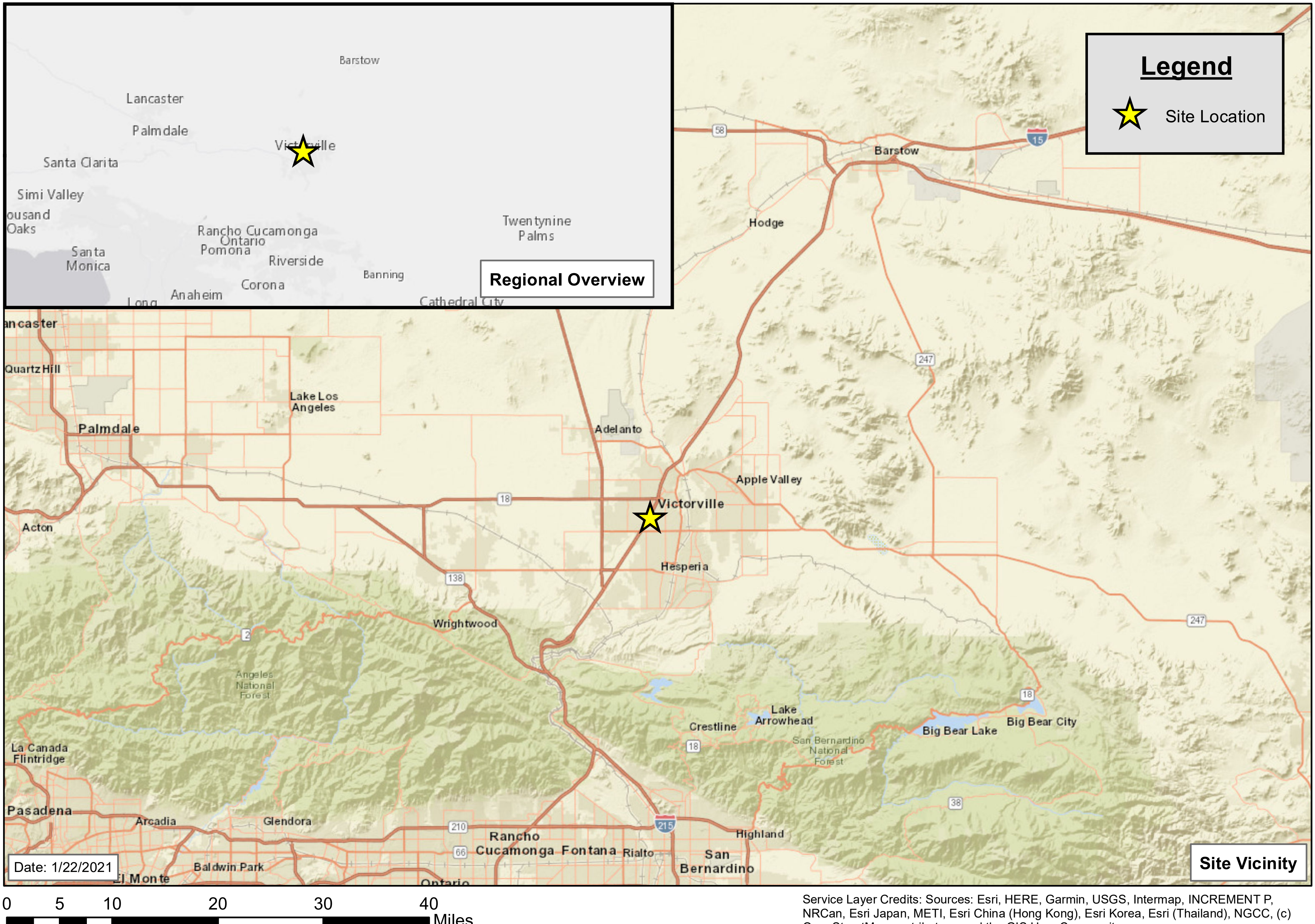
Photo 3.

Photo 4.

Photo 5

Photo 6

Photo 7



Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

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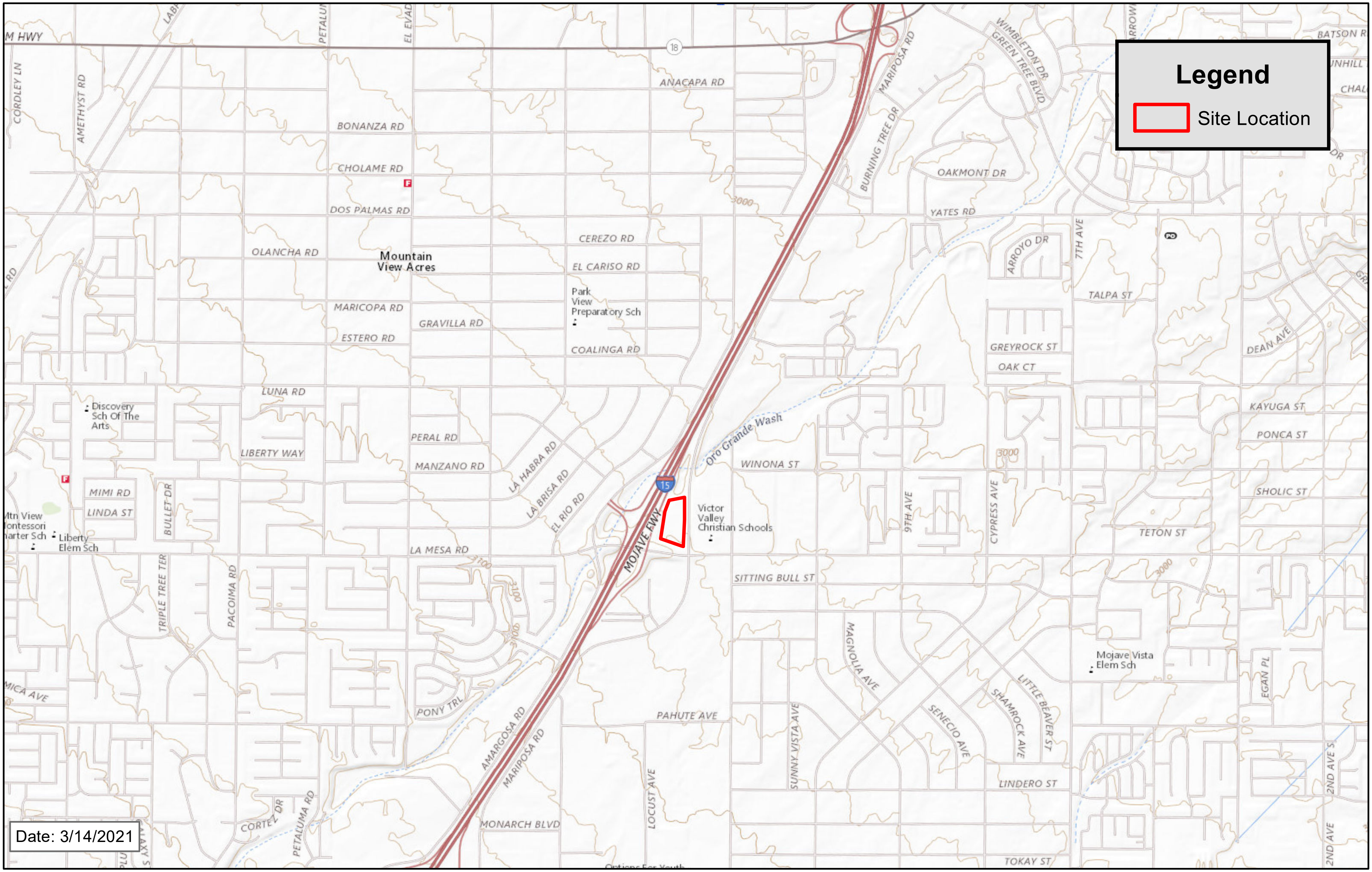
Figure 1 - Regional Overview Site Vicinity	Maverik Fuel Station Victorville, CA



0 0.15 0.3 0.6 0.9 1.2 Miles

1 inch = 2,000 feet

Imagery Date: 8/6/2017

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed October 2018.

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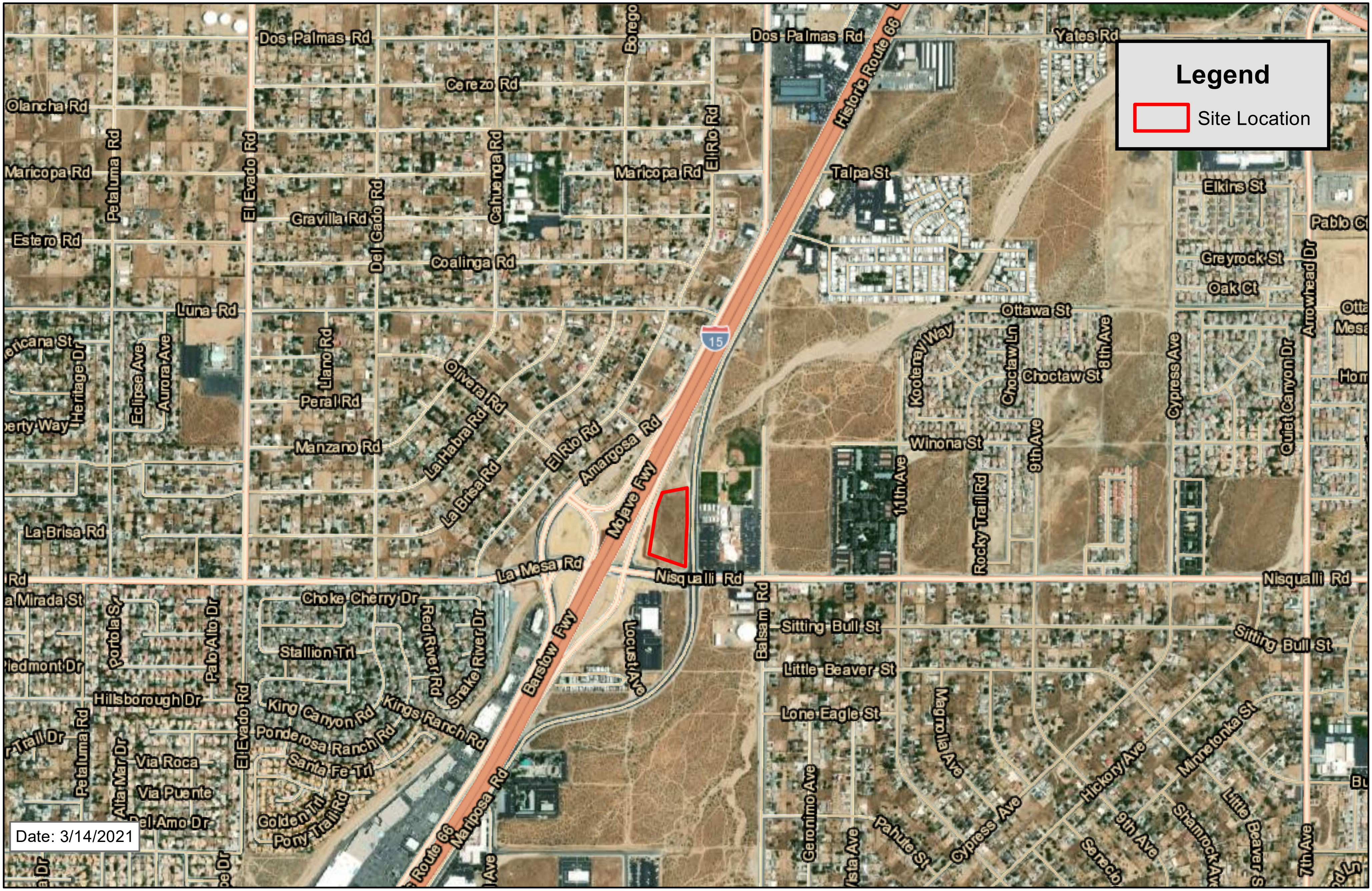
Figure 2 Site Location	Maverik Fuel Station Victorville, CA



0 0.1 0.2 0.4 0.6 0.8 Miles

1 inch = 1,250 feet

Imagery Date: 8/6/2017

Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,

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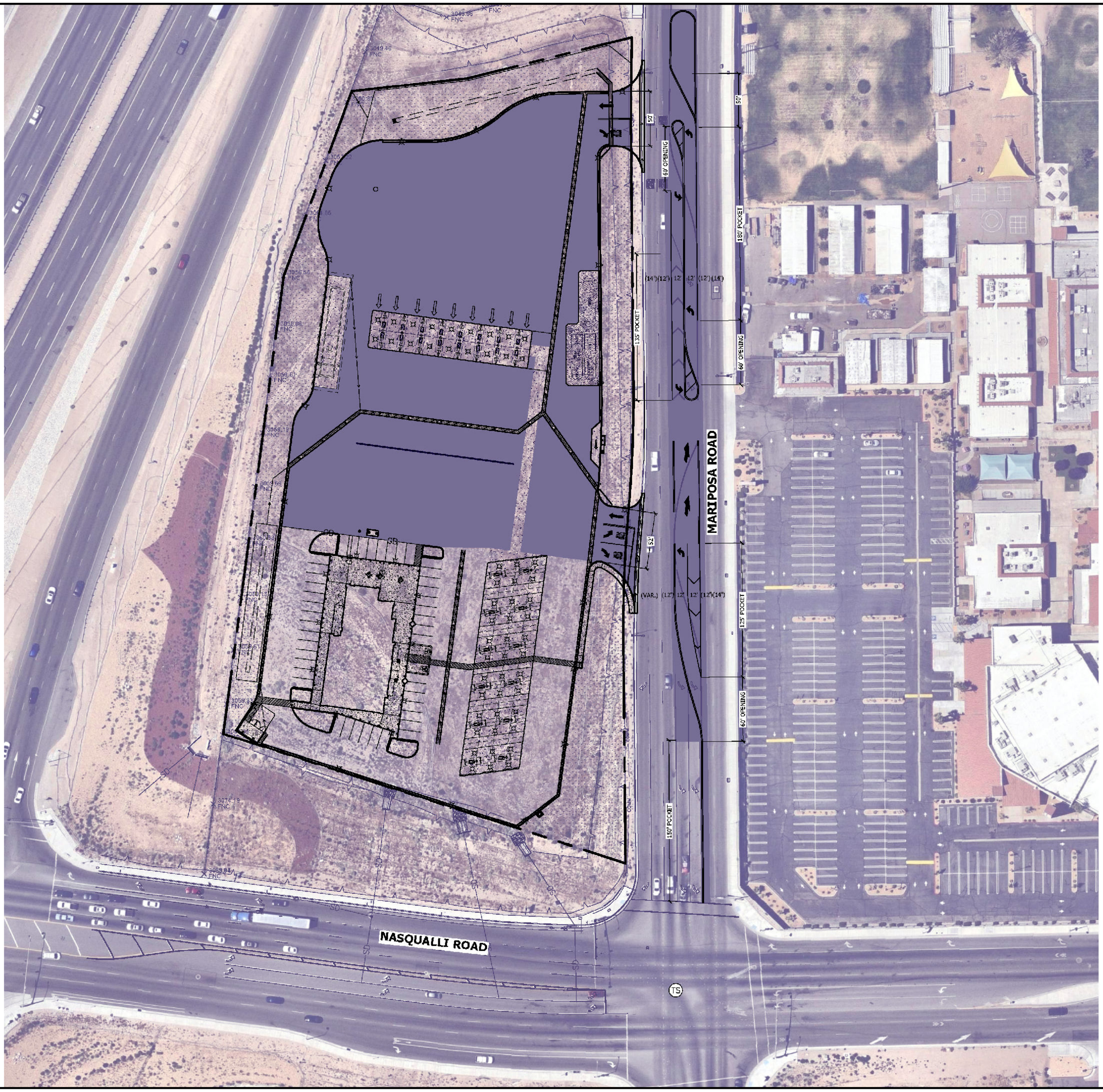
Figure 3 Site Location	Maverik Fuel Station Victorville, CA



Date: 3/12/2021

Service Layer Credits: Maverik

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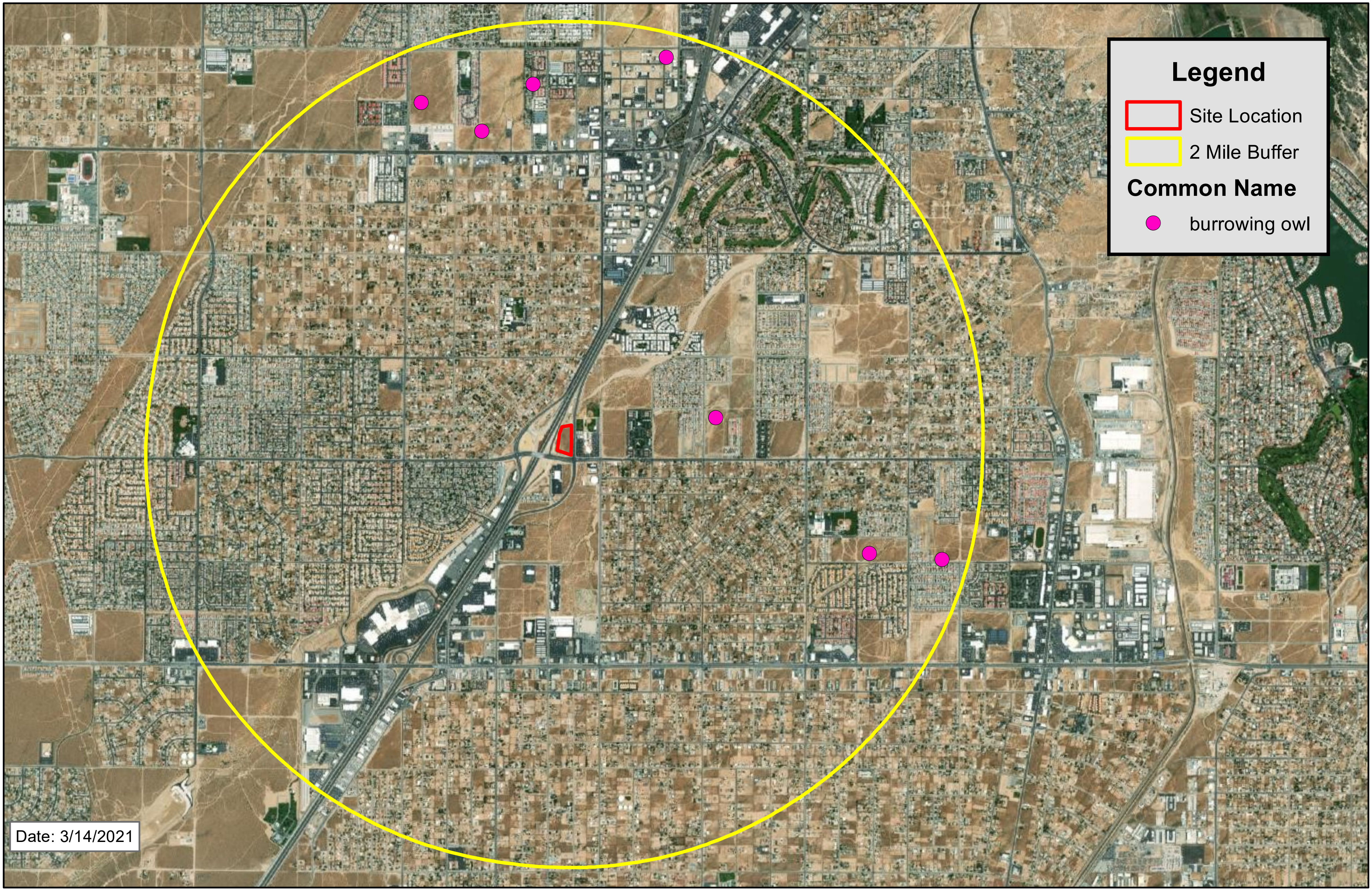
Figure 4 Site Plan	Maverik Fuel Station Victorville, CA



0 0.25 0.5 1 1.5 2 Miles

1 inch = 3,292 feet

Imagery Date: 5/31/2019

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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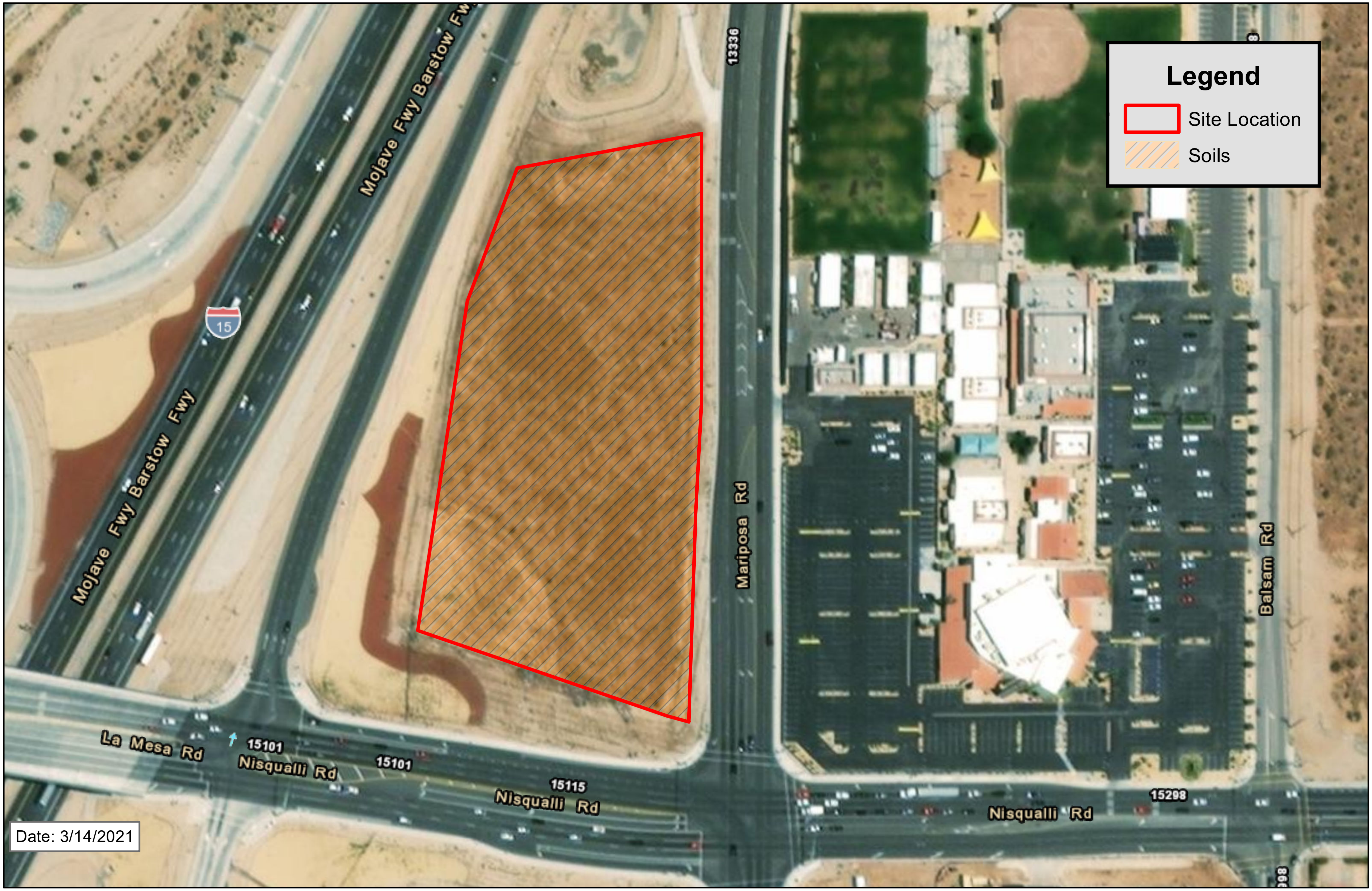
Figure 5 CNDDB - 2 Mile	Maverik Fuel Station Victorville, CA



0 0.0125 0.025 0.05 0.075 0.1
Miles

1 inch = 167 feet

Imagery Date: 5/31/2019

Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,

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N

Figure 6 Soils	Maverik Fuel Station Victorville, CA

Table 1
Sensitive Species Potential to Occur

Scientific Name	Common Name	Federal Listing	State Listing	Other Statuses	Habitats	Potential To Occur
Plants						
Canbya candida	white pygmy-poppy	None	None	CNPS 4.2	Joshua tree woodland, Mojavean desert scrub, Pinyon, and juniper woodland in gravelly, sandy, or granitic soils. 600-1460 m	Habitat on site is ruderal creosote scrub and soils are graded and compacted. Potential to occur is **low**.
Castilleja plagiotoma	Mojave paintbrush	None	None	CNPS 4.3	Great Basin scrub (alluvial), Joshua tree woodland, Lower montane coniferous forest, Pinyon, and juniper woodland. 300-2500 m	Habitat on site is ruderal creosote scrub and soils are graded and compacted. Potential to occur is **low**.
Loeflingia squarrosa var. *artemisiarum*	sagebrush loeflingia	None	None	CNPS 2B.2 | BLM Sensitive	Great Basin scrub, Sonoran desert scrub, desert dunes. Sandy flats and dunes. Sandy areas around clay slicks w/Sarcobatus, Atriplex, Tetradymia, etc. 700-1615 m.	Sand dunes are not present on site. Potential to occur is **low**.
Muilla coronata	crowned muilla	None	None	CNPS 4.2	Chenopod scrub, Joshua tree woodland, Mojavean desert scrub, Pinyon, and juniper woodland. 670-1960 m	Habitat on site is ruderal creosote scrub and soils are graded and compacted. Potential to occur is **low**.
Opuntia basilaris var. *brachyclada*	short-joint beavertail	None	None	CNPS 1B.2 | BLM Sensitive | USF Sensitive	Chaparral, Joshua tree woodland, Mojavean desert scrub, pinyon-juniper woodland. Sandy soil or coarse, granitic loam. 425-1800 m.	Habitat on site is ruderal creosote scrub and soils are graded and compacted. Potential to occur is **low**.
Quercus turbinella	shrub live oak	None	None	CNPS 4.3	Chaparral, Cismontane woodland, Lower montane coniferous forest, Pinyon, and juniper woodland. 1200-2000 m	Elevation at project site does not exceed 1100 m. Potential to occur is **low**.
Mammals						
Xerospermophilus mohavensis	Mohave ground squirrel	None	Threatened	BLM Sensitive | IUCN Vulnerable	Open desert scrub, alkali scrub & Joshua tree woodland. Also feeds in annual grasslands. Restricted to Mojave Desert. Prefers sandy to gravelly soils, avoids rocky areas. Uses burrows at base of shrubs for cover. Nests are in burrows.	Habitat on site is ruderal creosote scrub and soils are graded and compacted. Potential to occur is **low**.
Birds						

Scientific Name	Common Name	Federal Listing	State Listing	Other Statuses	Habitats	Potential To Occur
Athene cunicularia	burrowing owl	None	None	BLM Sensitive | CDFW Species of Special Concern | IUCN Least Concern | USFWS Birds of Conservation Concern	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.	No appropriate-sized burrows on site. Potential to occur is **low**.
Gymnogyps californianus	California condor	Endangered	Endangered	CDF Sensitive | CDFW Fully Protected | IUCN Critically Endangered | NACBI Red Watch List	Require vast expanses of open savannah, grasslands, and foothill chaparral in mountain ranges of moderate altitude.	Mountain habitat is not on site. Potential to occur is **low**.
Lanius ludovicianus	loggerhead shrike	None	None	CDFW Species of Special Concern | IUCN Least Concern | USFWS Birds of Conservation Concern	Broken woodlands, savannah, pinyon-juniper, Joshua tree, and riparian woodlands, desert oases, scrub & washes. Prefers open country for hunting, with perches.for scanning, and dense shrubs and brush for nesting.	Habitat on site is ruderal creosote scrub and soils are graded and compacted. Potential to occur is **low**.
Setophaga petechia	yellow warbler	None	None	CDFW Species of Special Concern | USFWS Birds of Conservation Concern	Riparian plant associations near 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.	Riparian habitat is not on site. Potential to occur is **low**.
Reptiles						
Gopherus agassizii	desert tortoise	Threatened	Threatened	IUCN Vulnerable	Most common in desert scrub, desert wash, and Joshua tree habitats; occurs in almost every desert habitat. Require friable soil for burrow and nest construction. Creosote bush habitat with large annual wildflower blooms preferred.	Creosote scrub is on site; however, the project is in a fenced location and no large burrows were on site. Potential to occur is **low**.
Phrynosoma blainvillii	coast horned lizard	None	None	BLM Sensitive | CDFW Species of Special Concern | IUCN Least Concern	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	Open areas for sunning and scrub for cover are on site. Species has potential to occur.

Scientific Name	Common Name	Federal Listing	State Listing	Other Statuses	Habitats	Potential To Occur
					soil for burial, and abundant supply of ants and other insects.	

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."

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 C – Cultural Resources Assessment

CULTURAL RESOURCES ASSESSMENT

Maverick Gas Station Project
Victorville, San Bernardino County, California

Prepared for:

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Prepared by:

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Project No. KIM2103

Data Base Information:
Type of Study: Intensive Survey
Resources: None
Keywords: None
USGS Quadrangle: 7.5-minute *Hesperia* (1980),*California*

BCRCONSULTING LLC

March 23, 2021

MANAGEMENT SUMMARY

BCR Consulting LLC (BCR Consulting) is under contract to Kimley-Horn to complete a Cultural Resources Assessment of the proposed Maverick Gas Station Project (the project) located in Victorville, San Bernardino County, California. A cultural resources records search, intensive-level pedestrian field survey, Native American Heritage Commission (NAHC) Sacred Lands File Search, and vertebrate paleontological resources overview were conducted for the project in partial fulfillment of the California Environmental Quality Act (CEQA). The records search revealed that seven previous cultural resource studies have taken place and six cultural resources have been identified within 0.5-miles of the project site. One of the previous studies has assessed the project site and no cultural resources have been identified within its boundaries. No cultural resources of any kind (including historic-period or prehistoric archaeological resources, or historic-period architectural resources) were identified during the field survey. Therefore, no significant impact related to historical resources is anticipated and no further investigations are recommended for the proposed project unless:

- The proposed project is changed to include areas that have not been subject to this cultural resource assessment;
- Cultural materials are encountered during project activities.

The current study attempted to determine whether significant archaeological deposits were present on the proposed project site. Although none were yielded during the records search and field survey, ground-disturbing activities have the potential to reveal buried deposits not observed on the surface. Prior to the initiation of ground-disturbing activities, field personnel should be alerted to the possibility of buried prehistoric or historic cultural deposits. In the event that field personnel encounter buried cultural materials, work in the immediate vicinity of the find should cease and a qualified archaeologist should be retained to assess the significance of the find. The qualified archaeologist shall have the authority to stop or divert construction excavation as necessary. If the qualified archaeologist finds that any cultural resources present meet eligibility requirements for listing on the California Register or the National Register of Historic Places (National Register), plans for the treatment, evaluation, and mitigation of impacts to the find will need to be developed. Prehistoric or historic cultural materials that may be encountered during ground-disturbing activities include:

- historic-period artifacts such as glass bottles and fragments, cans, nails, ceramic and pottery fragments, and other metal objects;
- historic-period structural or building foundations, walkways, cisterns, pipes, privies, and other structural elements;
- prehistoric flaked-stone artifacts and debitage (waste material), consisting of obsidian, basalt, and or cryptocrystalline silicates;
- groundstone artifacts, including mortars, pestles, and grinding slabs;
- dark, greasy soil that may be associated with charcoal, ash, bone, shell, flaked stone, groundstone, and fire affected rocks;
- human remains.

Findings were positive during the Sacred Lands File search with the NAHC. The results of the Sacred Lands File search are provided in Appendix A. The Legislature added requirements regarding tribal cultural resources for CEQA in Assembly Bill 52 (AB 52) that took effect July 1, 2015. AB 52 requires consultation with California Native American tribes and consideration of tribal cultural resources in the CEQA process. By including tribal cultural resources early in the CEQA process, the legislature intended to ensure that local and Tribal governments, public agencies, and project proponents would have information available, early in the project planning process, to identify and address potential adverse impacts to tribal cultural resources. By taking this proactive approach, the legislature also intended to reduce the potential for delay and conflicts in the environmental review process. To help determine whether a project may have such an effect, the Public Resources Code requires a lead agency to consult with any California Native American tribe that requests consultation and is traditionally and culturally affiliated with the geographic area of a Proposed Project. Since the City will initiate and carry out the required AB52 Native American Consultation, the results of the consultation are not provided in this report. However, this report may be used during the consultation process, and BCR Consulting staff is available to answer questions and address concerns as necessary.

According to CEQA Guidelines, projects subject to CEQA must determine whether the project would “directly or indirectly destroy a unique paleontological resource”. The appended Paleontological Overview provided in Appendix B has recommended that:

> The geologic unit underlying the project area is mapped entirely as alluvium deposits dating to the Pleistocene epoch (Dibblee, 2008). Pleistocene alluvial units are considered to be of high paleontological sensitivity. The Western Science Center does not have localities within the project area, but does have numerous localities within similarly mapped alluvial sediments throughout the region. Pleistocene alluvial deposits in southern California are well documented and known to contain abundant fossil resources including those associated with Columbian mammoth (*Mammuthus columbi*), Pacific mastodon (*Mammut pacificus*), Sabertooth cat (*Smilodon fatalis*), Ancient horse (*Equus sp*.) and many other Pleistocene megafauna.
>
> Any fossils recovered from the Maverick Gas Station Project area would be scientifically significant. Excavation activity associated with development of the area has the potential to impact the paleontologically sensitive Pleistocene alluvial units and it is the recommendation of the Western Science Center that a paleontological resource mitigation plan be put in place to monitor, salvage, and curate any recovered fossils associated with the current study area.

If human remains are encountered during any project activities, State Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. The County Coroner must be notified of the find immediately. If the remains are determined to be prehistoric, the Coroner will notify the NAHC, which will determine and notify a Most Likely Descendant (MLD). With the permission of the landowner or his/her authorized representative, the MLD may inspect the site of the discovery. The MLD shall complete the inspection within 48 hours of notification by the NAHC.

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INTRODUCTION

BCR Consulting LLC (BCR Consulting) is under contract to Kimley-Horn to complete a Cultural Resources Assessment of the proposed Maverick Gas Station Project (the project) located in the City of Victorville (City), San Bernardino County, California. A cultural resources records search, reconnaissance-level pedestrian field survey, Native American Heritage Commission (NAHC) Sacred Lands File Search, and vertebrate paleontological resources overview were conducted for the project in partial fulfillment of the California Environmental Quality Act (CEQA).

Project Description and Location

This will be a development project. The project site, as identified in this report, will occupy a portion of Section 30, Township 5 North, Range 4 West, San Bernardino Baseline and Meridian. It is depicted on the United States Geological Survey (USGS) *Hesperia* (1980)*, California* 7.5-minute topographic quadrangle (Figure 1).

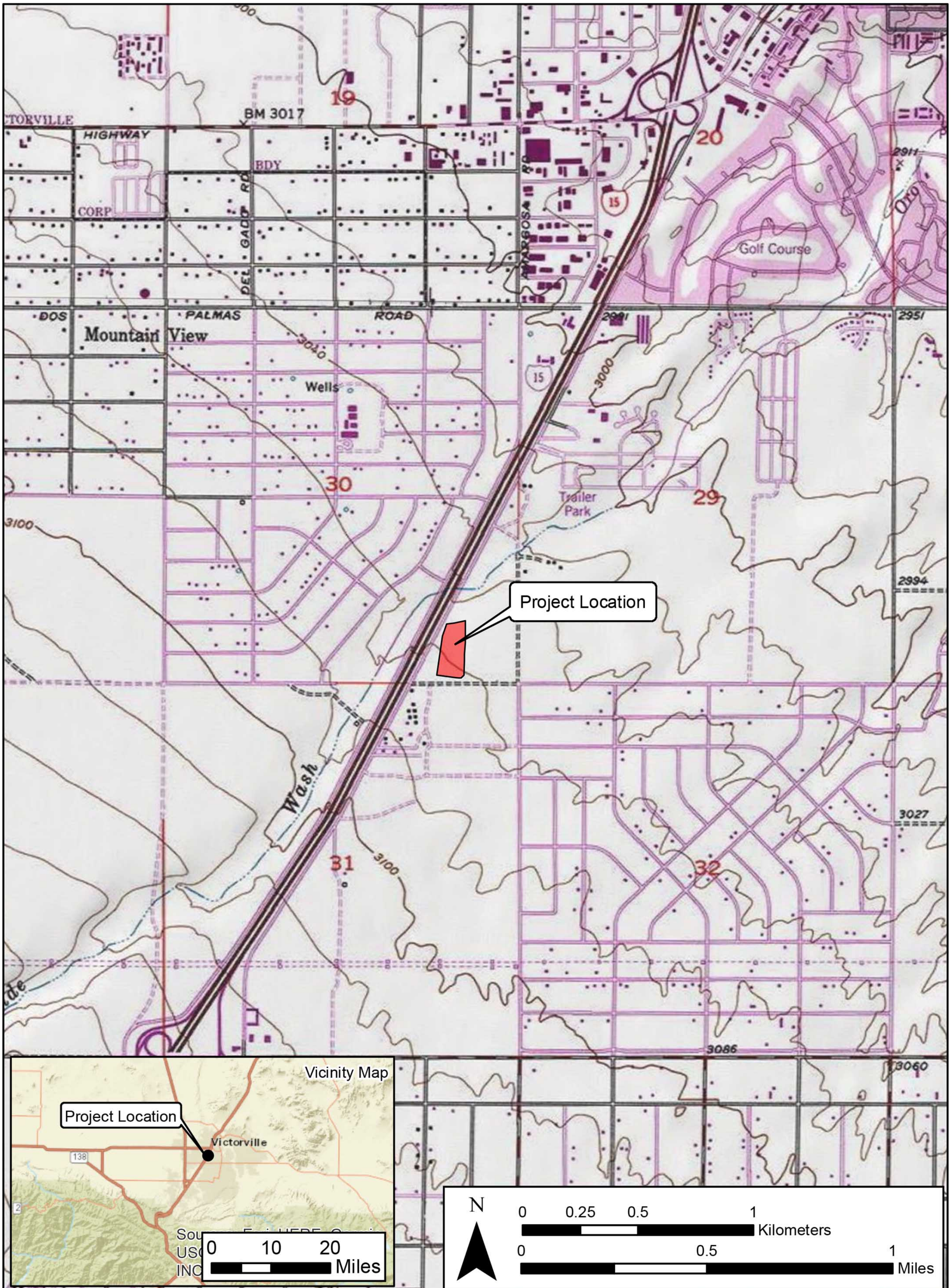
Regulatory Setting

The California Environmental Quality Act. CEQA applies to all discretionary projects undertaken or subject to approval by the state's public agencies (California Code of Regulations 14(3), § 15002(i)). Under CEQA, "A project with an effect 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" (Cal. Code Regs. tit. 14(3), § 15064.5(b)). State CEQA Guidelines section 15064.5(a) defines a "historical resource" as a resource that meets one or more of the following criteria:

- Listed in, or eligible for listing in, the California Register of Historical Resources (California Register)
- Listed in a local register of historical resources (as defined at Cal. Public Res. Code § 5020.1(k))
- Identified as significant in a historical resource survey meeting the requirements of § 5024.1(g) of the Cal. Public Res. Code
- Determined to be a historical resource by a project's lead agency (Cal. Code Regs. tit. 14(3), § 15064.5(a))

A historical resource consists of "Any object, building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California…Generally, a resource shall be considered by the lead agency to be 'historically significant' if the resource meets the criteria for listing in the California Register of Historical Resources" (Cal. Code Regs. tit. 14(3), § 15064.5(a)(3)).

The significance of a historical resource is impaired when a project demolishes or materially alters in an adverse manner those physical characteristics of a historical resource that convey its historical significance and that justify its eligibility for the California Register. If an



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Project Location Site
Mariposa Road/Nasqualli Road
Maverick Gas Station Project

Figure 1

Reference: ESRI; USGS Quad: Hesperia (1980), California

Kimley-Horn

impact on a historical or archaeological resource is significant, CEQA requires feasible measures to minimize the impact (State CEQA Guidelines § 15126.4 (a)(1)). Mitigation of significant impacts must lessen or eliminate the physical impact that the project will have on the resource.

Section 5024.1 of the Cal. Public Res. Code established the California Register. Generally, a resource is considered by the lead agency to be “historically significant” if the resource meets the criteria for listing in the California Register (Cal. Code Regs. tit. 14(3), § 15064.5(a)(3)). The eligibility criteria for the California Register are similar to those of the National Register of Historic Places (National Register), and a resource that meets one or more of the eligibility criteria of the National Register will be eligible for the California Register.

The California Register program encourages public recognition and protection of resources of architectural, historical, archaeological, and cultural significance, identifies historical resources for state and local planning purposes, determines eligibility for state historic preservation grant funding and affords certain protections under CEQA. Criteria for Designation:

1. Associated with events that have made a significant contribution to the broad patterns of local or regional history or the cultural heritage of California or the United States.
2. Associated with the lives of persons important to local, California or national history.
3. Embodies the distinctive characteristics of a type, period, region or method of construction or represents the work of a master or possesses high artistic values.
4. Has yielded, or has the potential to yield, information important to the prehistory or history of the local area, California or the nation.

In addition to meeting one or more of the above criteria, the California Register requires that sufficient time has passed since a resource’s period of significance to “obtain a scholarly perspective on the events or individuals associated with the resources.” (CCR 4852 [d][2]). Fifty years is normally considered sufficient time for a potential historical resource, and in order that the evaluation remain valid for a minimum of five years after the date of this report, all resources older than 45 years (i.e. resources from the “historic-period”) will be evaluated for California Register listing eligibility, or CEQA significance. The California Register also requires that a resource possess integrity. This is defined as the ability for the resource to convey its significance through seven aspects: location, setting, design, materials, workmanship, feeling, and association.

Finally, CEQA requires that significant effects on unique archaeological resources be considered and addressed. CEQA defines a unique archaeological resource as any archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1. Contains information needed to answer important scientific research questions and there is a demonstrable public interest in that information.

2. Has a special and particular quality such as being the oldest of its type or the best available example of its type.
3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

CEQA Guidelines Section 15064.5 Appendix G includes significance criteria relative to archaeological and historical resources. These have been utilized as thresholds of significance here, and a project would have a significant environmental impact if it would:

a) cause a substantial adverse change in the significance of a historical resource as defined in section 10564.5;
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 10564.5;
c) Disturb any human remains, including those interred outside of formal cemeteries.

Tribal Cultural Resources. The Legislature added requirements regarding tribal cultural resources for CEQA in Assembly Bill 52 (AB 52) that took effect July 1, 2015. AB 52 requires consultation with California Native American tribes and consideration of tribal cultural resources in the CEQA process. By including tribal cultural resources early in the CEQA process, the legislature intended to ensure that local and Tribal governments, public agencies, and project proponents would have information available, early in the project planning process, to identify and address potential adverse impacts to tribal cultural resources. By taking this proactive approach, the legislature also intended to reduce the potential for delay and conflicts in the environmental review process. To help determine whether a project may have such an effect, the Public Resources Code requires a lead agency to consult with any California Native American tribe that requests consultation and is traditionally and culturally affiliated with the geographic area of a Proposed Project. Since the City will initiate and carry out the required AB52 Native American Consultation, the results of the consultation are not provided in this report. However, this report may be used during the consultation process, and BCR Consulting staff are available to answer questions and address comments as necessary.

Paleontological Resources. CEQA provides guidance relative to significant impacts on paleontological resources, indicating that a project would have a significant impact on paleontological resources if it disturbs or destroys a unique paleontological resource or site or unique geologic feature. Section 5097.5 of the California Public Resources Code specifies that any unauthorized removal of paleontological remains is a misdemeanor. Further, California Penal Code Section 622.5 sets the penalties for damage or removal of paleontological resources. CEQA documentation prepared for projects would be required to analyze paleontological resources as a condition of the CEQA process to disclose potential impacts. Please note that as of January 2018 paleontological resources are considered in the geological rather than cultural category. Therefore, paleontological resources are not summarized in the body of this report. A paleontological overview completed by the Western Science Center is provided as Appendix B.

NATURAL SETTING

Geology

The project is located in the southwestern portion of the Mojave Desert. Sediments within the project boundaries include a geologic unit composed of old alluvial deposits formed during the Pleistocene and young alluvial-fan deposits formed during the late Pleistocene and Holocene Epochs of the Quaternary Period (Miller and Matti 2006, Lambert 1994:17). The units are composed of "slightly consolidated, undissected to slightly dissected deposits of poorly sorted sand and silt containing scattered subangular pebbles" (Miller and Matti 2006). Field observations during the current study are basically consistent with these descriptions, and are described further in Results, below.

Hydrology

The project elevation is approximately 3,055 feet above mean sea level (AMSL). Sheetwashing and some rilling occur from southwest to northeast, and water from the Oro Grande Wash flows adjacent to the project site to the east, eventually flowing into the Mojave River approximately five miles to the northeast. To the south, the peaks of the San Gabriel Mountains rise above 10,000 feet and are often capped with snow until late spring or early summer. The area currently exhibits a relatively arid climate, with dry, hot summers and cool winters. Rainfall ranges from five to 15 inches annually (Jaeger and Smith 1971:36-37). Precipitation usually occurs in the form of winter and spring rain or snow at high elevations, with occasional warm monsoonal showers in late summer.

Biology

The mild climate of the late Pleistocene allowed piñon-juniper woodland to thrive throughout most of the Mojave (Van Devender et al. 1987). The vegetation and climate during this epoch attracted significant numbers of Rancholabrean fauna, including dire wolf, saber toothed cat, short-faced bear, horse, camel, antelope, mammoth, as well as birds which included pelican, goose, duck, cormorant, and eagle (Reynolds 1988). The drier climate of the middle Holocene resulted in the local development of complementary flora and fauna, which remain largely intact to this day. Common native plants include creosote, cacti, rabbit bush, interior golden bush, cheese bush, species of sage, buckwheat at higher elevations and near drainages, Joshua tree, and various grasses. Common native animals include include coyotes, cottontail and jackrabbits, rats, mice, desert tortoises, roadrunners, raptors, turkey vultures, and other bird species (see Williams et al. 2008).

CULTURAL SETTING

Prehistory

The prehistoric cultural setting of the Mojave Desert has been organized into many chronological frameworks (see Warren and Crabtree 1986; Bettinger and Taylor 1974; Lanning 1963; Hunt 1960; Wallace 1958, 1962, 1977; Wallace and Taylor 1978; Campbell and Campbell 1935), although there is no definitive sequence for the region. The difficulties in establishing cultural chronologies for the Mojave are a function of its enormous size and the small amount of archaeological excavations conducted there. Moreover, throughout prehistory many groups have occupied the Mojave and their territories often overlap spatially and chronologically resulting in mixed artifact deposits. Due to dry climate and capricious geological processes, these artifacts rarely become integrated in-situ. Lacking a milieu hospitable to the preservation of cultural midden, Mojave chronologies have relied upon temporally diagnostic artifacts, such as projectile points, or upon the presence/absence of other temporal indicators, such as groundstone. Such methods are instructive, but can be limited by prehistoric occupants' concurrent use of different artifact styles, or by artifact re-use or re-sharpening, as well as researchers' mistaken diagnosis, and other factors (see Flenniken 1985; Flenniken and Raymond 1986; Flenniken and Wilke 1989). Recognizing the shortcomings of comparative temporal indicators, this study synthesizes Warren and Crabree (1986), who have drawn upon this method to produce a commonly cited and relatively comprehensive chronology.

Paleoindian (12,000 to 10,000 BP) and Lake Mojave (10,000 to 7,000 BP) Periods. Climatic warming characterizes the transition from the Paleoindian Period to the Lake Mojave Period. This transition also marks the end of Pleistocene Epoch and ushers in the Holocene. The Paleoindian Period has been loosely defined by isolated fluted (such as Clovis) projectile points, dated by their association with similar artifacts discovered in-situ in the Great Plains (Sutton 1996:227-228). Some fluted bifaces have been associated with fossil remains of Rancholabrean mammals approximately dated to ca. 13,300-10,800 BP near China Lake in the northern Mojave Desert. The Lake Mojave Period has been associated with cultural adaptations to moist conditions, and resource allocation pointing to more lacustrine environments than previously (Bedwell 1973; Hester 1973). Artifacts that characterize this period include stemmed points, flake and core scrapers, choppers, hammerstones, and crescentics (Warren and Crabtree 1986:184). Projectile points associated with the period include the Silver Lake and Lake Mojave styles. Lake Mojave sites commonly occur on shorelines of Pleistocene lakes and streams, where geological surfaces of that epoch have been identified (Basgall and Hall 1994:69).

Pinto Period (7,000 to 4,000 BP). The Pinto Period has been largely characterized by desiccation of the Mojave. As formerly rich lacustrine environments began to disappear, the artifact record reveals more sporadic occupation of the Mojave, indicating occupants' recession to the more hospitable fringes (Warren 1984). Pinto Period sites are rare, and are characterized by surface manifestations that usually lack significant in-situ remains. Artifacts from this era include Pinto projectile points and a flake industry similar to the Lake Mojave tool complex (Warren 1984), though use of Pinto projectile points as an index artifact for the era has been disputed (see Schroth 1994). Milling stones have also occasionally been associated with sites of this period (Warren 1984).

Gypsum Period. (4,000 to 1,500 BP). A temporary return to moister conditions during the Gypsum Period is postulated to have encouraged technological diversification afforded by the relative abundance of resources (Warren 1984:419-420; Warren and Crabtree 1986:189). Lacustrine environments reappear and begin to be exploited during this era (Shutler 1961, 1968). Concurrently a more diverse artifact assemblage reflects intensified reliance on plant resources. The new artifacts include milling stones, mortars, pestles, and a proliferation of Humboldt Concave Base, Gypsum Cave, Elko Eared, and Elko Corner-notched dart points (Warren 1984; Warren and Crabtree 1986). Other artifacts include leaf-shaped projectile points, rectangular-based knives, drills, large scraper planes, choppers, hammer stones, shaft straighteners, incised stone pendants, and drilled slate tubes. The bow and arrow appears around 2,000 BP, evidenced by the presence of a smaller type of projectile point, the Rose Spring point (Rogers 1939; Shutler 1961).

Saratoga Springs Period (1,500 to 800 BP). During the Saratoga Springs Period regional cultural diversifications of Gypsum Period developments are evident within the Mojave. Basketmaker III (Anasazi) pottery appears during this period, and has been associated with turquoise mining in the eastern Mojave Desert (Warren and Crabtree 1986:191). Influences from Patayan/Yuman assemblages are apparent in the southern Mojave, and include buff and brown wares often associated with Cottonwood and Desert Side-notched projectile points (Warren 1984:423). Obsidian becomes more commonly used throughout the Mojave and characteristic artifacts of the period include milling stones, mortars, pestles, ceramics, and ornamental and ritual objects. More structured settlement patterns are evidenced by the presence of large villages, and three types of identifiable archaeological sites (major habitation, temporary camps, and processing stations) emerge (McGuire and Hall 1988). Diversity of resource exploitation continues to expand, indicating a much more generalized, somewhat less mobile subsistence strategy.

Shoshonean Period (800 BP to Contact). The Shoshonean period is the first to benefit from contact-era ethnography –as well as be subject to its inherent biases. Interviews of living informants allowed anthropologists to match artifact assemblages and particular traditions with linguistic groups, and plot them geographically (see Kroeber 1925; Gifford 1918; Strong 1929). During the Shoshonean Period continued diversification of site assemblages, and reduced Anasazi influence both coincide with the expansion of Numic (Uto-Aztecan language family) speakers across the Great Basin, Takic (Uto-Aztecan language family) speakers into southern California, and the Hopi across the Southwest (Sutton 1996). Hunting and gathering continued to diversify, and the diagnostic arrow points include desert side-notch and cottonwood triangular. Ceramics continue to proliferate, though are more common in the southern Mojave during this period (Warren and Crabtree 1986). Trade routes have become well established across the Mojave, particularly the Mojave Trail, which transported goods and news across the desert via the Mojave River, to the west of the current project. Trade in the western Mojave was more closely related to coastal groups than others.

Ethnography

The Uto-Aztecan "Serrano" people occupied the western Mojave Desert periphery. Kroeber (1925) applied the generic term "Serrano" to four groups, each with distinct territories: the Kitanemuk, Tataviam, Vanyume, and Serrano. Only one group, in the San Bernardino Mountains and West-Central Mojave Desert, ethnically claims the term Serrano. Bean and Smith (1978) indicate that the Vanyume, an obscure Takic population, was found along the Mojave River at the time of Spanish contact. The Kitanemuk lived to the north and west, while the Tataviam lived to the west. The Serrano lived mainly to the south (Bean and Smith 1978). All may have used the western Mojave area seasonally. Historical records are unclear concerning precise territory and village locations. It is doubtful that any group, except the Vanyume, actually lived in the region for several seasons yearly.

History

Historic-era California is generally divided into three periods: the Spanish or Mission Period (1769 to 1821), the Mexican or Rancho Period (1821 to 1848), and the American Period (1848 to present).

Spanish Period. The first European to pass through the project area is thought to be a Spaniard called Father Francisco Garces. Having become familiar with the area, Garces acted as a guide to Juan Bautista de Anza, who had been commissioned to lead a group across the desert from a Spanish outpost in Arizona to set up quarters at the Mission San Gabriel in 1771 near what today is Pasadena (Beck and Haase 1974). This is the first recorded group crossing of the Mojave Desert and, according to Father Garces' journal, they camped at the headwaters of the Mojave River, one night less than a day's march from the mountains. Today, this is estimated to have been approximately 11 miles southeast of Victorville (Marenczuk 1962). Garces was followed by Alta California Governor Pedro Fages, who briefly explored the western Mojave region in 1772. Searching for San Diego Presidio deserters, Fages had traveled north through Riverside to San Bernardino, crossed over the mountains into the Mojave Desert, and then journeyed westward to the San Joaquin Valley (Beck and Haase 1974).

Mexican Period. In 1821, Mexico overthrew Spanish rule and the missions began to decline. By 1833, the Mexican government passed the Secularization Act, and the missions, reorganized as parish churches, lost their vast land holdings, and released their neophytes (Beattie and Beattie 1974).

American Period. The American Period, 1848–Present, began with the Treaty of Guadalupe Hidalgo. The Gold Rush had attracted huge numbers of American settlers and in 1850, California was accepted into the Union. The cattle industry reached its greatest prosperity during the first years of the American Period. Mexican Period land grants had created large pastoral estates in California, and demand for beef during the Gold Rush led to a cattle boom that lasted from 1849–1855. However, beginning about 1855, the demand for beef began to decline due to imports of sheep and cattle from the eastern U.S. When the beef market collapsed, many California ranchers lost their ranchos. A series of disastrous floods in 1861–1862, followed by a significant drought diminished the economic impact of local ranching. This decline combined with ubiquitous agricultural and real estate developments of the late 19th century, set the stage for diversified economic pursuits that have continued to proliferate to this day (Beattie and Beattie 1974; Cleland 1941).

Local Sequence. The city of Victorville, located in Victor Valley, was first settled in 1858 by Ex-army captain Aaron G Lane during a mass exodus of Mormons from San Bernardino back to Utah. Lane set up a ranch on the west bank of the Mojave River which became a popular stop for travelers coming through the area (Marenczuk 1962; Gutglueck 2015a). The railway connecting San Bernardino and Barstow, which traveled through present day Victorville, was completed in 1884. The completion of the railway brought many travelers through the town and allowed mining in the area, which was already known for its rich silver and gold mines, to flourish and expand into granite, limestone, and marble (Gutglueck 2015a). The town of Victor, later to be renamed Victorville, was founded in 1885 and named for Jacob N Victor, a general manager of operations for the California Southern Railroad, a subsidiary of the Atchison, Topeka and Santa Fe Railway who were responsible for the newly constructed railway (Gudde 1962; Wallenfeldt 2020).

The town's name was changed to Victorville in 1904 because many were confusing the town for another of the same name in Colorado (Wallenfeldt 2020; Gutglueck 2015b). Population, commerce, and development continued growing throughout the early 20th century and the town established the Victorville Chamber of Commerce in 1911. The first high school in Victorville was opened in 1914 and cement plants were being opened throughout the larger area during the early 20th century. The Mojave River provided relatively plentiful water, which allowed local agriculture to flourish alongside mining operations until its decline in 1972

(Nordyke 1974). Canals distributed runoff water for farms near the river (Turner and Presswood 1963:86), and a shallow water table encouraged well drilling for various remote agricultural endeavors. Local crops included alfalfa, onions, watermelon, cantaloupe, non-citrus fruits, and other produce (Marenczuk 1962; Turner and Presswood 1963:86). Farming, mining, cement manufacturing, and business brought in by travelers, continued to be one of the main drivers of Victorville's budding economy throughout much of the 20th century. George Air Force Base, initially named Victorville Air Base, was completed in 1943 in response to World War II (Colton Courier 1943). It was decommissioned in 1992. The former air base is now the Southern California Logistics Airport and is used mainly for business, military, and freight (Wallenfeldt 2020).

The town of Oro Grande, Spanish for "Big Gold", represents the most significant historic settlement in the region, and is located in the Victor Valley approximately ten miles northeast of the project. As the town's name suggests local prospecting resulted in the establishment of several mines that produced silver and gold refined by the Oro Grande gold mill during the 1880s. The historic Mojave Trail and later the California Southern Railway provided convenient transport for the minerals via stagecoach and train across the desert between Salt Lake City and San Bernardino. Subsequent discoveries of silica and lime deposits punctuated the development of a new mining industry, and by 1907 cement plants began operating along the railroad. With the exception of brief hiatus periods during the great depression and World War II, the cement industry has remained vital to this day (Thompson 2000; Gudde 1975; Marenczuk 1962:9).

PERSONNEL

David Brunzell, M.A., RPA acted as the Project Manager/Principal Investigator for the current study, and authored the technical report with contributions from BCR Consulting Field Director Joseph Orozco, MA, RPA. The South Central Coastal Information Center (SCCIC) at California State University, Fullerton completed the record search. Mr. Orozco carried out the pedestrian field survey.

METHODS

Research

South Central Coastal Information Center (SCCIC) staff completed an archaeological records search using SCCIC records of California State University, Fullerton on February 24, 2021. This archival research reviewed the status of all recorded historic and prehistoric cultural resources, and survey and excavation reports completed within one mile of the current project. Additional resources reviewed included the National Register of Historic Places (National Register), the California Register, the Built Environmental Resource Directory (BERD), and documents and inventories published by the California Office of Historic Preservation. These include the lists of California Historical Landmarks, California Points of Historical Interest, Listing of National Register Properties, and the Inventory of Historic Structures.

Field Survey

A reconnaissance-level cultural resources field survey of the project site was conducted on January 27, 2020. The survey was conducted by walking parallel transects spaced approximately 15 meters apart across the project site. Digital photographs were taken at various points within the project site.

RESULTS

Research

Data from the South Central Coastal Information Center (SCCIC) revealed seven previous cultural resource studies have taken place, and six cultural resources have been identified within 0.5-miles of the project site. One of the previous studies has assessed the project site and no cultural resources have been identified within its boundaries. Detailed bibliographic information and a records search map are provided as Appendix A. The records search is summarized as follows:

Table A. Cultural Resources and Reports Within One Mile of the Project Site

USGS Quad	Cultural Resources	Studies
Hesperia (1980), *California*	P-36-4269: Historic-Period Road (1/8 mile W) P-36-6821: Historic-Period Refuse Scatter (50 feet SW) P-36-11424: Historic-Period Domestic Site (1/4 Mile NE) P-36-11425: Historic-Period Domestic Site (1/2 Mile NE) P-36-11426: Historic-Period Refuse Scatter (1/2 Mile NE) P-36-11427: Historic-Period Refuse Scatter (1/2 Mile NE)	SB-2577*, 4221, 4454, 4455, 4973, 5217, 7156

*Previously assessed project site for cultural resources.

Field Survey

During the field survey, BCR Consulting archaeologists identified no cultural resources (including historic-period or prehistoric archaeological sites, or historic-period architectural resources) of any kind within the project site boundaries. The project has been subject to severe artificial disturbances associated with an adjacent freeway onramp, surrounding road construction, and storm drains which enter the project from the south. Vegetation consisted of seasonal grasses and afforded surface visibility of approximately 85 percent.

RECOMMENDATIONS

BCR Consulting conducted an intensive survey of the Maverick Gas Station Project in the City of Victorville, San Bernardino County, California. No cultural resources of any kind (including historic-period or prehistoric archaeological resources, or historic-period architectural resources) were identified. Therefore, no significant impact related to historical resources is anticipated and no further investigations are recommended unless:

- The proposed project is changed to include areas that have not been subject to this cultural resource assessment;
- Cultural materials are encountered during project activities.

The current study attempted to determine whether significant archaeological deposits were present on the proposed project site. Although none were yielded during the records search and field survey, ground-disturbing activities have the potential to reveal buried deposits not observed on the surface. Prior to the initiation of ground-disturbing activities, field personnel should be alerted to the possibility of buried prehistoric or historic cultural deposits. In the event that field personnel encounter buried cultural materials, work in the immediate vicinity of the find should cease and a qualified archaeologist should be retained to assess the significance of the find. The qualified archaeologist shall have the authority to stop or divert construction excavation as necessary. If the qualified archaeologist finds that any cultural resources present meet eligibility requirements for listing on the California Register or the National Register of Historic Places (National Register), plans for the treatment, evaluation, and mitigation of impacts to the find will need to be developed. Prehistoric or historic cultural materials that may be encountered during ground-disturbing activities include:

- historic-period artifacts such as glass bottles and fragments, cans, nails, ceramic and pottery fragments, and other metal objects;
- historic-period structural or building foundations, walkways, cisterns, pipes, privies, and other structural elements;
- prehistoric flaked-stone artifacts and debitage (waste material), consisting of obsidian, basalt, and or cryptocrystalline silicates;
- groundstone artifacts, including mortars, pestles, and grinding slabs;
- dark, greasy soil that may be associated with charcoal, ash, bone, shell, flaked stone, groundstone, and fire affected rocks;
- human remains.

Findings were positive during the Sacred Lands File search with the NAHC. The results of the Sacred Lands File search are provided in Appendix A. The Legislature added requirements regarding tribal cultural resources for CEQA in Assembly Bill 52 (AB 52) that took effect July 1, 2015. AB52 requires consultation with California Native American tribes and consideration of tribal cultural resources in the CEQA process. By including tribal cultural resources early in the CEQA process, the legislature intended to ensure that local and Tribal governments, public agencies, and project proponents would have information available, early in the project planning process, to identify and address potential adverse impacts to tribal cultural resources. By taking this proactive approach, the legislature also intended to reduce the potential for delay and conflicts in the environmental review process. To help determine whether a project may have such an effect, the Public Resources Code requires a lead agency to consult with any California Native American tribe that requests consultation and is traditionally and culturally affiliated with the geographic area of a Proposed Project. Since the City will initiate and carry out the required AB52 Native American Consultation, the results of the consultation are not provided in this report. However, this report may be used during the consultation process, and BCR Consulting staff is available to answer questions and address concerns as necessary.

According to CEQA Guidelines, projects subject to CEQA must determine whether the project would “directly or indirectly destroy a unique paleontological resource”. The appended Paleontological Overview provided in Appendix B has recommended that:

> The geologic unit underlying the project area is mapped entirely as alluvium deposits dating to the Pleistocene epoch (Dibblee, 2008). Pleistocene alluvial units are considered to be of high paleontological sensitivity. The Western Science Center does not have localities within the project area, but does have numerous localities

> within similarly mapped alluvial sediments throughout the region. Pleistocene alluvial deposits in southern California are well documented and known to contain abundant fossil resources including those associated with Columbian mammoth (*Mammuthus columbi*), Pacific mastodon (*Mammut pacificus*), Sabertooth cat (*Smilodon fatalis*), Ancient horse (*Equus sp*.) and many other Pleistocene megafauna.
>
> Any fossils recovered from the Maverick Gas Station Project area would be scientifically significant. Excavation activity associated with development of the area has the potential to impact the paleontologically sensitive Pleistocene alluvial units and it is the recommendation of the Western Science Center that a paleontological resource mitigation plan be put in place to monitor, salvage, and curate any recovered fossils associated with the current study area.

If human remains are encountered during any project activities, State Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. The County Coroner must be notified of the find immediately. If the remains are determined to be prehistoric, the Coroner will notify the NAHC, which will determine and notify a Most Likely Descendant (MLD). With the permission of the landowner or his/her authorized representative, the MLD may inspect the site of the discovery. The MLD shall complete the inspection within 48 hours of notification by the NAHC

If human remains are encountered, State Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to PRC Section 5097.98. The County Coroner must be notified of the find immediately. If the remains are determined to be prehistoric, the Coroner will notify the NAHC, which will determine and notify a Most Likely Descendant (MLD). With the permission of the landowner or his/her authorized representative, the MLD may inspect the site of the discovery. The MLD shall complete the inspection within 48 hours of notification by the NAHC.

REFERENCES

Basgall, Mark E., and M.C. Hall
1994 Perspectives on the Early Holocene Archaeological Record of the Mojave Desert. In *Kelso Conference Papers 1987-1992,* edited by G.D. Everson and J.S. Schneider.

Bean, Lowell John, and Charles R. Smith
1978 *California*, edited by R.F. Heizer. Handbook of North American Indians, Vol. 8, W.C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

Beattie, George W., and Helen P. Beattie
1974 *Heritage of the Valley: San Bernardino's First Century*. Biobooks: Oakland.

Beck, Warren A., and Ynez D. Haase
1974 *Historical Atlas of California*. Oklahoma City: University of Oklahoma Press.

Bedwell, S.F.
1973 *Fort Rock Basin: Prehistory and Environment.* University of Oregon Books, Eugene.

Bettinger, Robert L., and R.E. Taylor
1974 Suggested Revisions in Archaeological Sequences of the Great Basin and Interior Southern California. *Nevada Archaeological Survey Research Papers* 3:1-26.

Campbell, E., and W. Campbell
1935 The Pinto Basin. *Southwest Museum Papers* 9:1-51.

City of Lancaster
2020 *History of Lancaster.* Electronic Document: http://www.cityoflancasterca.org/index .aspx?page=218. Accessed 5/22/20.

Cleland, Robert Glass
1941 *The Cattle on a Thousand Hills—Southern California, 1850-80.* San Marino, California: Huntington Library.

Colton Courier
1943 Victorville Army Air Base Talent On Radio Jan. 22. *The Colton Courier* 15 January: Page 6. Colton, California.

Flenniken, J.J.
1985 Stone Tool Reduction Techniques as Cultural Markers. *Stone Tool Analysis: Essays in Honor of Don E. Crabtree,* edited by M.G. Plew, J.C. Woods, and M.G. Pavesic. University of New Mexico Press, Albuquerque.

Flenniken, J.J. and A.W. Raymond
1986 Morphological Projectile Point Typology: Replication, Experimentation, and Technological Analysis. *American Antiquity* 51:603-614.

Flenniken, J.J. and Philip J. Wilke
1989 Typology, Technology, and Chronology of Great Basin Dart Points. *American Anthropologist* 91:149-158.

Ford, Daniel
1998 *The Diary of a Bomber Pilot.* Smithsonian Institution Press. Washington D.C.

Gifford, Edward W.
1918 Clans and Moieties in Southern California. *University of California Publications in American Archaeology and Anthropology* 14(22)155-219.

Gurba, Norma H.
2005 *Images of America: Lancaster.* Arcadia Publishing. Charleston.

Gutglueck, Mark

2015a Victor Valley History 1856 – 1888*. San Bernardino County Sentinel* 11 September. San Bernardino, California.

2015b Victor Valley History 1889 – 1913. *San Bernardino County Sentinel* 29 August. San Bernardino, California.

Hester, T.R.
1973 *Chronological Ordering of Great Basin Prehistory.* Contributions of the Archaeological Research Facility 17, University of California, Berkeley.

Hunt, Alice P.
1960 *The Archaeology of the Death Valley Salt Pan, California.* University of Utah Anthropological Papers No. 47.

Jaeger, Edmund C., and Arthur C. Smith
1971 *Introduction to the Natural History of Southern California*. California Natural History Guides: 13. Los Angeles: University of California Press.

Kroeber, Alfred L.
1925 *Handbook of the Indians of California.* Bureau of American Ethnology Bulletin 78. Washington D.C.: Smithsonian Institution. Reprinted in 1976, New York: Dover.

Lambert, David
1994 *The Field Guide to Prehistoric Life.* Diagram Visual Information Ltd., New York.

Lanning, Edward P.
1963 The Archaeology of the Rose Spring Site (Iny-372). *University of California Publications in American Archaeology and Ethnology* 49(3):237-336.

Lewis Publishing Company
1889 *An Illustrated History of Los Angeles County.* Lewis Publishing Company. Chicago.

Los Angeles County Library
2015 *Antelope Valley Community History.* Electronic Resource: https://lacountylibrary.org/antelope-valley-local-history/. Accessed 5/22/20.

Marenczuk, Wesley
1962 *The Story of Oro Grande.* Published by Author. Victor Valley College.

McGuire, K.R., and M.C. Hall
1988 *The Archaeology of Tiefort Basin, Fort Irwin, San Bernardino County, California.* Prepared for the U.S. Army Corps of Engineers, Los Angeles District.

Miller Fred K. and Jonathan C. Matti
2006 *Geologic Map of the San Bernardino and Santa Ana 30' x 60' Quadrangles, California.* U.S. Geological Survey, Spokane and Tucson.Reynolds, R.E.

Reynolds, R.E.
1988 *Paleontologic Resource Overview and Management Plan for Edwards Air Force Base, California.* San Bernardino County Museum, Redlands, California.

Rogers, M.J.
1939 *Early Lithic Industries of the Lower Basin of the Colorado River and Adjacent Desert Areas.* San Diego Museum Papers No. 3.

Schroth, Adella Beverly
1994 *The Pinto Point Controversy in the Western United States.* Unpublished PhD Dissertation, University of California, Riverside.

Shutler, Richard, Jr.
1961 *Lost City, Pueblo Grande de Nevada.* NV State Museum Anthropological Papers 5.

1968 The Great Basin Archaic. In Prehistory in the Western United States. *Contributions in Anthropology* 1(3):24-26. Edited by C. Irwin-Williams, Eastern New Mexico Univ.

Strong, William Duncan
1929 Aboriginal Society in Southern California. *University of California Publications in American Archaeology and Ethnology* 26(1):1-358*.*

Sutton, Mark Q.
1996 The Current Status of Archaeological Research in the Mojave Desert. *Journal of California and Great Basin Anthropology* 18(2):221-257.

United States Geological Survey
1980 *Hesperia, California* 7.5-minute topographic quadrangle map.

Van Devender, Larry M., Gary L. Shumway, and Russell D. Hartill
1987 *Desert Fever: An Overview of Mining in the California Desert.* Living West Press, Canoga Park, California.

Wallace, William J.
1958 Archaeological Investigation in Death Valley National Monument. *University of California Archaeological Survey Reports* 42:7-22*.*

1962 Prehistoric Cultural Development in the Southern California Deserts. *American Antiquity* 28(2):172-180.

1977 A Half Century of Death Valley Archaeology. *The Journal of California Anthropology* 4(2):249-258.

Wallace, William J., and Edith S. Taylor
1978 *Ancient Peoples and Cultures of Death Valley National Monument.* Acoma Books, Ramona, California.

Wallenfeldt, Jeff
2020 *Victorville California, United States.* Encyclopedia Britannica, Inc. Edinburgh, Scotland.

Warren, Claude N.
1984 The Desert Region. In *California Archaeology*, by M. Moratto, contributions by D.A. Fredrickson, C. Raven, and C.N. Warren, pp. 339–430. Academic Press, Orlando, Florida.

Warren, Claude N., and R.H. Crabtree
1986 The Prehistory of the Southwestern Great Basin. In *Handbook of the North American Indians, Vol. 11, Great Basin,* edited by W.L. d'Azevedo, pp.183-193. W.C. Sturtevant, General Editor. Smithsonian Institution, Washington D.C.

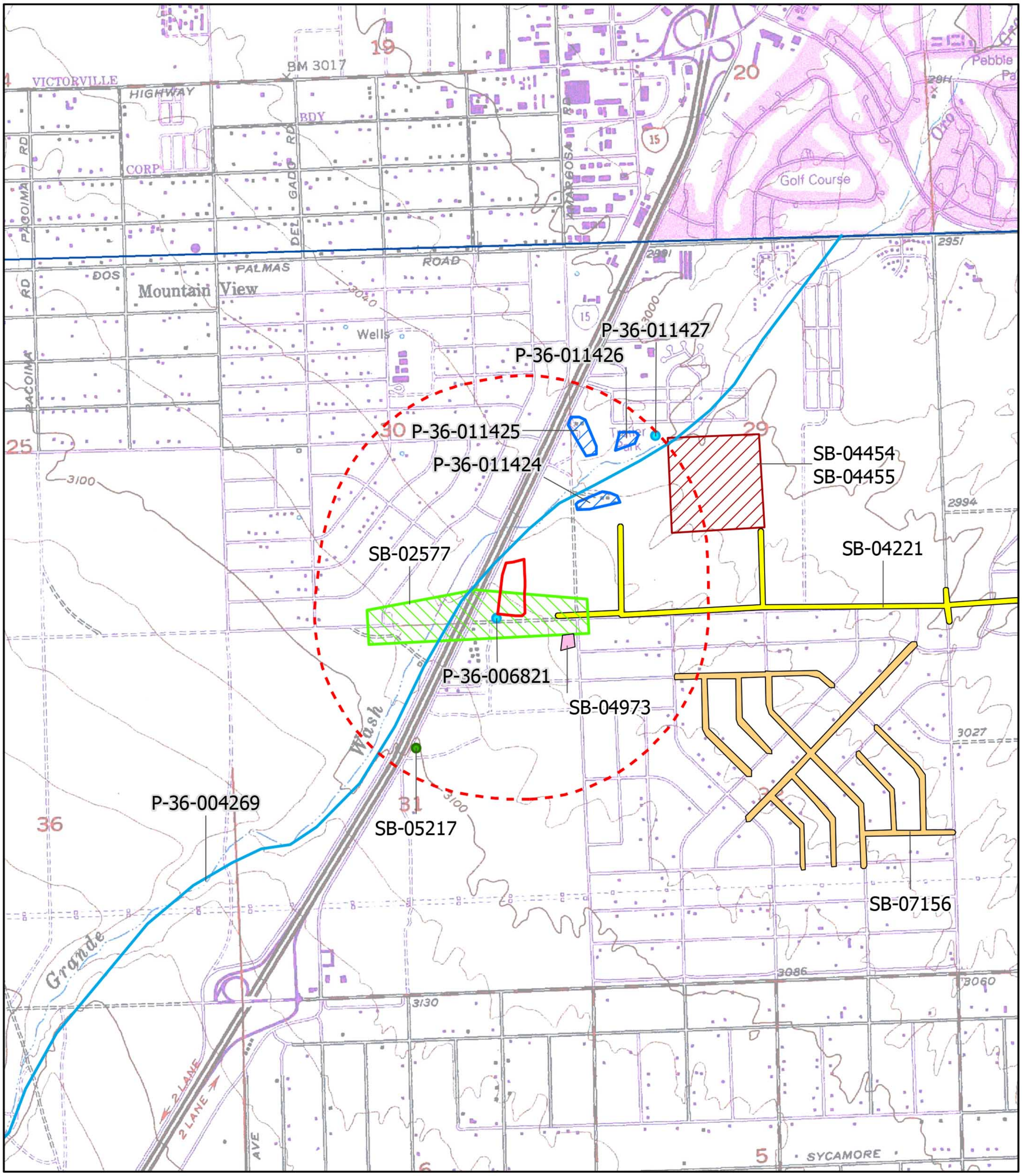
Weiser, Kathy
2017 *Legends of America.* Electronic Document: legendsofamerica.com/ah-homestead/. Accessed 11/21/17.

Williams, Patricia, Leah Messinger, Sarah Johnson
2008 *Habitats Alive! An Ecological Guide to California's Diverse Habitats.* California Institute for Biodiversity, Claremont, California.

APPENDIX A

CULTURAL RESOURCES RECORDS SEARCH RESULTS

(CONFIDENTIAL: NOT FOR PUBLIC DISTRIBUTION)



N
W E
S
Miles
0 0.125 0.25 0.5

Resources within the project area: None
6 resources within a 1/2-mile radius
Reports within the project area: SB-02577
6 additional reports within a 1/2-mile radius

Hesperia, CA
USGS 7.5' PR: 1980
1:24,000
INV #22080
Feb 2021

South Central Coastal Information Center

May depict confidential cultural resource locations. Do not distribute.

Reports highlighted in orange are located within the project area but have NOT been scanned and are unavailable at this time.

Report List

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
SB-02577	NADB-R - 1062577; Voided - 91-3.11	1991	RHODES, L.E. and M.L. LILBURN	DRAFT HISTORIC PROPERTY SURVEY REPORT, CITY OF VICTORVILLE, LA MESA/NISQUALLY ROAD OVERPASS AT INTERSTATE 15, SAN BERNARDINO COUNTY (08-SBR-15, P.M. 38.43/39.17)	DAMES & MOORE	36-006821
SB-04221	NADB-R - 1064221	2004	MIRRO, MICHAEL	CULTURAL RESOURCES SURVEY OF 249 ACRES ON TEH KRAUSS & ADJACENT PROPERTY FOR NRCS. 5PP	APPLIED EARTHWORKS	
SB-04454	NADB-R - 1064454	2003	HOGAN, MICHAEL	ARCHAEOLOGICAL MONITORING OF EARTH-MOVING ACTIVITIES TRACT NO 16247 IN THE CITY OF VICTORVILLE, SAN BERNARDINO COUNTY, CA. 3PP	CRM TECH	
SB-04455	NADB-R - 1064455; Paleo -	2004	HOGAN, MICHAEL	ARCHAEOLOGICAL/PALEONTOLOGICAL MONITORING OF EARTH-MOVING ACTIVITIES NORTHEASTERN PORTION OF TT NO 16427 IN THE CITY OF VICTORVILLE, SAN BERNARDINO COUNTY, CA. 2PP	CRM TECH	
SB-04973	NADB-R - 1064973	2005	Weatherbee, Matthew	Identification and Evaluation of Historic Properties: Victor Valley Water District Infrastructure Improvements In and Near the City of Victorville, San Bernardino County, California.	CRM Tech	36-007694
SB-05217	NADB-R - 1065217	2004	MALAN, CHRISTY and CERRETO, RICHARD	CULTURAL RESOURCES ASSESSMENT FOR APN 3093-141-01 CITY OF VICTORVILLE SAN BERNARDINO COUNTY, CALIFORNIA		
SB-07156	NADB-R - 1067156	2011	Tang, Bai “Tom”, Daniel Ballester, and Nina Gallardo	Historical/Archaeological Resources Survey Report: Water Supply System Improvements Projects, Fiscal Years 2010/2011 – 2014/2015, Victorville Water District, San Bernardino County, California.	CRM TECH	36-000968, 36-002910, 36-006793, 36-007545, 36-007694, 36-009360, 36-010316, 36-012658

All listed resources have been previously verified by SCCIC staff.

Resource List

Primary No.	Trinomial	Other IDs	Type	Age	Attribute codes	Recorded by	Reports
P-36-004269	CA-SBR-004269H	Resource Name - Oro Grande Wash Road; Resource Name - SBCM-4659	Other	Historic	AH07	1980 (R.Reynolds); 1993 (RMW Paleo); 2007 (CRM Tech); 2009 (ESA)	SB-01027, SB-03020, SB-04186, SB-05553, SB-06957, SB-07495, SB-07971
P-36-006821	CA-SBR-006821H	Resource Name - VV-1	Site	Historic	AH04	1991 (Rhodes / Lilburn)	SB-02577
P-36-011424	CA-SBR-011424H	Resource Name - LMN/CGI Site 1	Site	Historic	AH02; AH04; AH05	2003 (CHANDLER)	
P-36-011425	CA-SBR-011425H	Resource Name - LMN/CGI Site 2	Site	Historic	AH02; AH04	2003 (CHANDLER)	
P-36-011426	CA-SBR-011426H	Resource Name - LMN/CGI Site 3	Site	Historic	AH04	2003 (CHANDLER)	
P-36-011427	CA-SBR-011427H	Resource Name - LMN/CGI Site 4	Site	Historic	AH04	2003 (CHANDLER)	

APPENDIX B

NATIVE AMERICAN HERITAGE COMMISSION CORRESPONDENCE

STATE OF CALIFORNIA **Gavin Newsom, *Governor***

NATIVE AMERICAN HERITAGE COMMISSION

NAHC HEADQUARTERS
1550 Harbor Boulevard
Suite 100
West Sacramento,
California 95691
(916) 373-3710
nahc@nahc.ca.gov
NAHC.ca.gov

February 9, 2021

Joseph Orozco
BCR Consulting LLC

Via Email to: josephorozco513@gmail.com

Re: Mariposa Road/Nasqualli Road Maverick Gas Station Project, San Bernardino County

Dear Mr. Orozco:

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 Chemehuevi Indian Tribe and 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 me. 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: Andrew.Green@nahc.ca.gov.

Sincerely,

Andrew Green

Andrew Green
Cultural Resources Analyst

Attachment

Native American Heritage Commission
Native American Contact List
San Bernardino County
2/9/2021

Chemehuevi Indian Tribe
Sierra Pencille, Chairperson
P.O. Box 1976 1990 Palo Verde Drive — Chemehuevi
Havasu Lake, CA, 92363
Phone: (760) 858 - 4219
Fax: (760) 858-5400
chairman@cit-nsn.gov

Morongo Band of Mission Indians
Denisa Torres, Cultural Resources Manager
12700 Pumarra Road — Cahuilla
Banning, CA, 92220 — Serrano
Phone: (951) 849 - 8807
Fax: (951) 922-8146
dtorres@morongo-nsn.gov

Morongo Band of Mission Indians
Robert Martin, Chairperson
12700 Pumarra Road — Cahuilla
Banning, CA, 92220 — Serrano
Phone: (951) 849 - 8807
Fax: (951) 922-8146
dtorres@morongo-nsn.gov

Quechan Tribe of the Fort Yuma Reservation
Jill McCormick, Historic Preservation Officer
P.O. Box 1899 — Quechan
Yuma, AZ, 85366
Phone: (760) 572 - 2423
historicpreservation@quechantribe.com

Quechan Tribe of the Fort Yuma Reservation
Manfred Scott, Acting Chairman Kw'ts'an Cultural Committee
P.O. Box 1899 — Quechan
Yuma, AZ, 85366
Phone: (928) 750 - 2516
scottmanfred@yahoo.com

San Fernando Band of Mission Indians
Donna Yocum, Chairperson
P.O. Box 221838 — Kitanemuk
Newhall, CA, 91322 — Vanyume
Phone: (503) 539 - 0933 — Tataviam
Fax: (503) 574-3308
ddyocum@comcast.net

San Manuel Band of Mission Indians
Jessica Mauck, Director of Cultural Resources
26569 Community Center Drive — Serrano
Highland, CA, 92346
Phone: (909) 864 - 8933
jmauck@sanmanuel-nsn.gov

Serrano Nation of Mission Indians
Mark Cochrane, Co-Chairperson
P. O. Box 343 — Serrano
Patton, CA, 92369
Phone: (909) 528 - 9032
serranonation1@gmail.com

Serrano Nation of Mission Indians
Wayne Walker, Co-Chairperson
P. O. Box 343 — Serrano
Patton, CA, 92369
Phone: (253) 370 - 0167
serranonation1@gmail.com

Twenty-Nine Palms Band of Mission Indians
Anthony Madrigal, Tribal Historic Preservation Officer
46-200 Harrison Place — Chemehuevi
Coachella, CA, 92236
Phone: (760) 775 - 3259
amadrigal@29palmsbomi-nsn.gov

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 Mariposa Road/Nasqualli Road Maverick Gas Station Project, San Bernardino County.

Native American Heritage Commission
Native American Contact List
San Bernardino County
2/9/2021

Twenty-Nine Palms Band of Mission Indians
Darrell Mike, Chairperson
46-200 Harrison Place
Coachella, CA, 92236
Phone: (760) 863 - 2444
Fax: (760) 863-2449
29chairman@29palmsbomi-nsn.gov

Chemehuevi

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 Mariposa Road/Nasqualli Road Maverick Gas Station Project, San Bernardino County.

APPENDIX C

PALEONTOLOGICAL RESOURCES OVERVIEW

WESTERN SCIENCE CENTER

BCR Consulting
Joseph Orozco
505 West 8th Street
Claremont , CA 91711

February 10, 2021

Dear Mr. Orozco,

This letter presents the results of a record search conducted for the Maverick Gas Station Project in the city of Victorville, San Bernardino County, California. The project site is located at the intersection of Mariposa Road and Nasqualli Road in Section 30 of Township 5 North and Range 4 West on the Hesperia, CA USGS 7.5 minute topographic quadrangle.

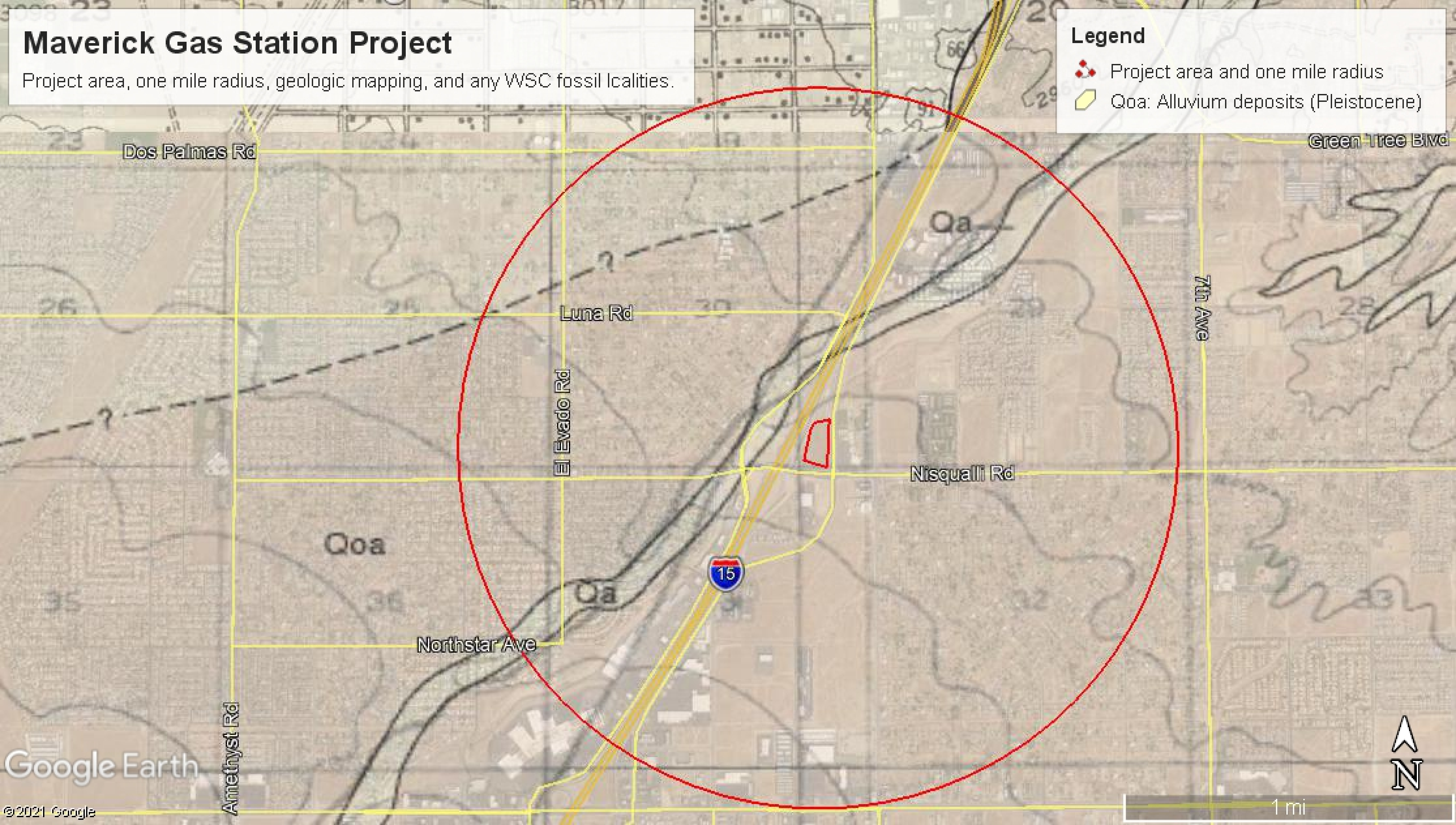
The geologic unit underlying the project area is mapped entirely as alluvium deposits dating to the Pleistocene epoch (Dibblee, 2008). Pleistocene alluvial units are considered to be of high paleontological sensitivity. The Western Science Center does not have localities within the project area, but does have numerous localities within similarly mapped alluvial sediments throughout the region. Pleistocene alluvial deposits in southern California are well documented and known to contain abundant fossil resources including those associated with Columbian mammoth (*Mammuthus columbi*), Pacific mastodon (*Mammut pacificus*), Sabertooth cat (*Smilodon fatalis*), Ancient horse (*Equus sp*.) and many other Pleistocene megafauna.

Any fossils recovered from the Maverick Gas Station Project area would be scientifically significant. Excavation activity associated with development of the area has the potential to impact the paleontologically sensitive Pleistocene alluvial units and it is the recommendation of the Western Science Center that a paleontological resource mitigation plan be put in place to monitor, salvage, and curate any recovered fossils associated with the current study area.

If you have any questions, or would like further information, please feel free to contact me at dradford@westerncentermuseum.org

Sincerely,

Darla Radford
Collections Manager


Maverick Gas Station Project
Project area, one mile radius, geologic mapping, and any WSC fossil lcalities.
Legend
Project area and one mile radius
Qoa: Alluvium deposits (Pleistocene)
Dos Palmas Rd
Green Tree Blvd
Qa
Luna Rd
7th Ave
El Evado Rd
Nisqualli Rd
Qoa
15
Qa
Northstar Ave
Amethyst Rd
Google Earth
©2021 Google
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1 mi

APPENDIX D

PROJECT PHOTOGRAPHS

Photo 1: overview from NE corner (view SW)

Photo 2: overview from NW corner (view N)

Photo 3: project overview (view E)

Photo 4: storm drain culverts (view W)

Photo 5: project overview (view S)

Photo 6: project overview (view N)

Appendix D – Energy Assessment

Construction Fuel Consumption

On-Site Diesel[1]	$MTCO_2e$	Gallons of Fuel[4]	Construction Year 2022 County Fuel	Percent
Demolition	0	0		
Site Preparation/Grading	60	5,907		
Building Construction	198	19,507		
Paving	50	4,966		
Architectural Coating	8	749		
Total	316	31,129	276,248,399	0.0113%

Off-Site Diesel[1]				
Demolition	0	0		
Site Preparation/Grading	66	6,475		
Building Construction	96	9,458		
Paving	0	0		
Architectural Coating	0	0		
Total	162	15,933	276,248,399	0.0058%

Off-Site Gasoline[2]				
Demolition	0	0		
Site Preparation/Grading	2	242		
Building Construction	60	6,810		
Paving	2	272		
Architectural Coating	4	488		
Total	69	7,813	869,495,029	0.0009%

Total Diesel Fuel		47,062	276,248,399	0.0170%
Total Gasoline Fuel		7,813	869,495,029	0.0009%
Total Construction Fuel	547	54,875		

Construction Phase[3]	Demolition			Site Preparation			Grading		
	On-Site Diesel (Off-Road)	Off-Site Diesel (Hauling/Vendor)	Off-Site Gas (Worker)	On-Site Diesel (Off-Road)	Off-Site Diesel (Hauling/Vendor)	Off-Site Gas (Worker)	On-Site Diesel (Off-Road)	Off-Site Diesel (Hauling/Vendor)	Off-Site Gas (Worker)
2022	0	0	0	34	0	1	26	66	1
Total	**0**	**0**	**0**	**34**	**0**	**1**	**26**	**66**	**1**

Construction Phase[3]	Building Construction			Paving			Architectural Coating		
	On-Site Diesel (Off-Road)	Off-Site Diesel (Hauling/Vendor)	Off-Site Gas (Worker)	On-Site Diesel (Off-Road)	Off-Site Diesel (Hauling/Vendor)	Off-Site Gas (Worker)	On-Site Diesel (Off-Road)	Off-Site Diesel (Hauling/Vendor)	Off-Site Gas (Worker)
2022	198	96	60	50	0	2	8	0	4
Total	**198**	**96**	**60**	**50**	**0**	**2**	**8**	**0**	**4**

Notes:

[1] Fuel used for off-road, hauling, and vendor trips assumed to be diesel.

[2] Fuel used for worker trips assumed to be gasoline.

[3] $MTCO_2e$ rates from CalEEMod (3.0 Construction Details).

[4] For CO2e emissions, see Chapter 13 (page 94); Conversion Ratios: Climate Registry, General Reporting Protocol, 2016.

Climate Registry Conversion Ratios:

- Gasoline: 10.15 kg CO_2 per gallon / 1,000 kg per metric ton

Construction Water Energy

Daily Soil Disturbance[1]	3	acres
Days of Soil Disturbance[2]	40	days
Water Concentration[3]	3,020	gallons/acre
Water Energy Intensity[4]	11,110	kWh/MG
Total Construction Water	0.30	million gallons
Construction Water Energy	3,355	kWh
	0.0034	GWh

Notes:

[1] Total daily acres disturbed from offroad equipment per CalEEMod (3.0 Construction Detail) and maximum SCAQMD LST values for soil-disturbing equipment.

[2] Number of days of construction (site prep and grading phases) with soil-disturbing equipment per CalEEMod (3.0 Construction Detail).

[3] Water application rate per Air and Waste Management Association's Air Pollution Engineering Manual.

[4] Water energy intensity factor for county subarea per CalEEMod User Guide, Appendix D, page D-343.

Operational Fuel

Vehicle Type	Percent[1]	Annual VMT[2]	MPG[3]	Annual Fuel (Gallons)	Fuel Type	San Bernardino County Gallons[4]	San Bernardino Percent		
Passenger Cars	0.93	6,868,600	21.6	317,991	Gas	864,004,222	0.0368%		44,971
Light/Medium Trucks	0.05	382,417	17.2	22,234	Diesel	279,166,484	0.0080%	0.0161%	0.00212%
Heavy Trucks/Other	0.02	138,697	6.1	22,737	Diesel	279,166,484	0.0081%		0.0012%
Total	1.00	7,389,707		362,962		1,143,170,706			

Land Use	LDA	LDT1	LDT2	MCY	MDV	LHD1	LHD2	MHD	OBUS	UBUS	SBUS	MH	HHD
Convenience Market with Gas Pumps	0.537845	0.056225	0.173186	0.023821	0.138405	0.025906	0.007191	0.011447	0.000611	0.000309	0.001097	0.005189	0.018769
	0.537845	**0.056225**	**0.173186**	**0.023821**	**0.138405**	**0.025906**	**0.007191**	**0.011447**	**0.000611**	**0.000309**	**0.001097**	**0.005189**	**0.018769**

Notes:

[1] Percent of vehicle trip distribution based on fleet mix from CalEEMod (4.4 Fleet Mix).

[2] Total annual operational VMT based on mitigated annual VMT from CalEEMod (4.2 Trip Summary Information).

[3] Average fuel economy derived from Department of Transportation.

[4] Total annual county fuel per EMFAC 2021 model of projected operational fuel usage.

Operational Water Energy

Mitigated Indoor	0.8	million gallons	
Indoor Energy Intensity Factor[1]	13,021	kWh/MG	
Mitigated Outdoor	0	million gallons	
Outdoor Energy Intensity Factor[2]	11,110	kWh/MG	
Operational Water Energy	14,769	kWh	0.014769

Land Use[3]	Unmitigated (MG)		Mitigated (MG)	
	Indoor	Outdoor	Indoor	Outdoor
Fast Food with Drive Thru	1	0	0	0
Convenience Market with Gas Pump	0	0	0	0
Gasoline/Service Station	0	0	0	0
Total Operational Water	**1**	**0**	**1**	**0**

Notes:

[1] Indoor water energy intensity factor for county subarea per CalEEMod User Guide, Appendix D, page D-343. Factor includes supply, treatment, distribution, and wastewater.

[2] Outdoor water energy intensity factor for county subarea per CalEEMod User Guide, Appendix D, page D-343. Factor includes supply, treatment, and distribution.

[3] Operational water use values per CalEEMod (7.2 Water by Land Use).

Elecricity/Natural Gas Energy

	Mitigated Project Annual Energy	San Bernardino County Annual Energy[3]	Percentage Increase		
Electricity (kWh/yr)	231,515	14,987,210,320	0.0015%	0.2315152	
Natural Gas (kBTU/yr)	869,955	54,727,226,300	0.0016%		
Natural Gas (therms/yr)	8,700	547,272,263	0.0016%		0.008699545

Land Use	Electricity[1] (kWh/yr)		Natural Gas[2] (kBTU/yr)	
	Unmitigated	Mitigated	Unmitigated	Mitigated
Convenience Markett with Gas	77,081	77,081	13,549	13,549
Fast Food with Drive Thru	141,538	141,538	815,125	815,125
Gasoline/Service Station	12,896	12,896	41,281	41,281
Asphalt	0	0	0	0
Total Energy	**231,515**	**231,515**	**869,955**	**869,955**

Notes:

[1] Electricity use per CalEEMod (5.3 Energy by Land Use).

[2] Natural Gas use per CalEEMod (5.2 Natural Gas by Land Use).

[3] County total energy values from California Energy Commission energy reports available through ecdms.energy.ca.gov.

Appendix E – Geotechnical Engineering Study

CMT ENGINEERING LABORATORIES

GEOTECHNICAL ENGINEERING STUDY

Proposed Maverik Store

NWC of Mariposa Road and Nisqualli Road
Victorville, California

CMT PROJECT NO. 15198

FOR:
Cardno, Inc.
1142 West 2320 South, Suite A
West Valley City, Utah 84119

September 10, 2020

ENGINEERING •GEOTECHNICAL •ENVIRONMENTAL (ESA I & II) • MATERIALS TESTING •SPECIAL INSPECTIONS • ORGANIC CHEMISTRY • PAVEMENT DESIGN •GEOLOGY

September 10, 2020

Mr. Russ Hamblin
Cardno, Inc.
1142 West 2320 South, Suite A
West Valley City, Utah 84119

Subject: Geotechnical Engineering Study
Proposed Maverik Store
NWC of Mariposa Road & Nisqualli Road
Victorville, California
CMT Project Number: 15198

Mr. Hamblin:

Submitted herewith is the report of our geotechnical engineering study for the subject site. This report contains the results of our findings and an engineering interpretation of the results with respect to the available project characteristics. It also contains recommendations to aid in the design and construction of the earth related phases of this project.

On August 22, 2020, a total of 6 bore holes were drilled at the site extending to depths between about 5.0 to 71.5 feet below the existing ground surface. Soil samples were obtained in the bore holes during the field operations and subsequently transported to our laboratory for further testing and observation.

Natural soils consisted of SAND (SM, SP-SM), and an occasional CLAY (CL) or SILT (ML) layer. Groundwater was not encountered within the bore holes. Based upon the results of our study the proposed structures may be supported on conventional strip and spread footings founded entirely on suitable, undisturbed natural soils, or on engineered fill extending to natural soils. A detailed discussion of design and construction criteria is presented in this report.

We appreciate the opportunity to work with you at this stage of the project. CMT offers a full range of Geotechnical Engineering, Geological, Material Testing, Special Inspection services, and Phase I and II Environmental Site Assessments. With offices throughout Utah, Idaho, and Arizona, our staff is capable of efficiently serving your project needs. If we can be of further assistance or if you have any questions regarding this project, please do not hesitate to contact us at (801) 492-4132.

Sincerely,
CMT Engineering Laboratories

Jeffrey J. Egbert, P.E. (UT), LEED A.P., M. ASCE
Senior Geotechnical Engineer

Reviewed By:

REGISTERED PROFESSIONAL ENGINEER
WILLIAM G. TURNER
No. C 43740
Exp. 3/1/21
CIVIL
STATE OF CALIFORNIA

William G. Turner, P.E. (CA C43740)
Senior Geotechnical Engineer

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 General

CMT Engineering Laboratories (CMT) was retained to conduct a geotechnical subsurface study for a proposed Maverik Store. The site is situated at the northwest corner of the intersection of Mariposa Road and Nisqualli Road in Victorville, California as shown in the **Vicinity Map** below.

VICINITY MAP

1.2 Objectives, Scope and Authorization

The objectives and scope of our study were planned in communications between Mr. Russ Hamblin of Cardno, Inc., and Mr. Jeffrey Egbert of CMT Engineering Laboratories (CMT). In general, the objectives of this study were to define and evaluate the subsurface soil and groundwater conditions at the site, and provide appropriate foundation, earthwork, pavement and seismic recommendations to be utilized in the design and construction of the proposed development.

In accomplishing these objectives, field explorations were performed on the site by Cardno, which consisted of the drilling/logging/sampling of 6 bore holes. Our scope of work included performing laboratory testing on samples of the subsurface soils collected in the bore holes as provided to us, and conducting an office program which included correlating available data, performing engineering analyses, and preparing this summary report.

1.3 Description of Proposed Construction

We understand that the proposed construction consists of a new Maverik convenience store and fuel station with accompanying fuel islands and canopies, and underground fuel storage tanks. We project that wall loads for the store building will not exceed 4,000 pounds per linear foot. Floor slab loads are anticipated to be relatively light, with an average uniform loading not exceeding 150 pounds per square foot.

The fuel island canopies will be supported by steel frames and columns extending to the foundation system. It is projected that the maximum canopy downward column loads will be on the order of 60,000 pounds. In addition, uplift and lateral loads will be imposed upon these foundations.

If the loading conditions are different than we have projected, please notify us so that any appropriate modifications to our conclusions and recommendations contained herein can be made.

We also understand the parking/drive paved areas will utilize both asphalt and concrete pavement. Concrete pavement will likely be installed in front of the proposed store structure, as well as in the canopy fuel islands and over the underground storage tank area. In other areas, asphalt concrete sections will likely be used. Traffic is projected to consist of mostly automobiles and light trucks (1,100/day), a few daily medium-weight delivery trucks (2/day), multiple fuel delivery trucks and semi-trucks (50/day), a weekly garbage truck, and an occasional fire truck.

1.4 Executive Summary

The most significant geotechnical aspects regarding site development include the following:

1. Topsoil on the surface, about 6 inches in thickness, to be removed.
2. Subsurface natural soils consisted predominately of SAND (SC, SM, SP-SM), with occasional layers of CLAY (CL) and SILT (ML), extending to the bottom of the bore holes.
3. Groundwater was not encountered to the maximum depth explored of about 71.5 feet below the surface.
4. The potential for liquefaction to occur in the soils we encountered is low.
5. Conventional foundations for the proposed structures can be supported on suitable, undisturbed natural sand soils, or entirely on engineered fill placed on suitable, undisturbed natural soils.

A qualified geotechnical engineer must assess that non-engineered fill (if encountered), topsoil, debris, disturbed or unsuitable soils have been removed and that suitable soils have been encountered prior to placing structural/site grading fills, footings, slabs, and pavements.

In the following sections, detailed discussions pertaining to the site and subsurface descriptions, geologic/seismic setting, earthwork, foundations, lateral resistance, lateral pressure, floor slabs, and pavements are provided.

2.0 FIELD EXPLORATION

2.1 General

In order to define and evaluate the subsurface soil and groundwater conditions, 6 bore holes were drilled at the site to depths of approximately 5.0 to 71.5 feet below the existing ground surface. Locations of the bore holes are presented on **Figure 1**.

Samples of the subsurface soils encountered in the bore holes were collected at varying depths through the hollow stem drill augers. Relatively undisturbed samples of the subsurface soils were obtained by driving a split-spoon sampler with 2.5-inch outside diameter rings/liners into the undisturbed soils below the drill augers. Disturbed samples were collected utilizing a standard split spoon sampler. This standard split spoon sampler was driven 18 inches into the soils below the drill augers using a 140 pound hammer free-falling a distance of 30 inches. The number of hammer blows needed for each 6 inch interval was recorded. The sum of the hammer blows for the final 12 inches of penetration is known as a standard penetration test (SPT) and this 'blow count' was recorded on the bore hole logs. Where more than 50 blows occurred before the 6-inch interval was achieved, the sampling was terminated and the number of blows and inches penetrated by the sampler were recorded. The blow count provides a reasonable approximation of the relative density of granular soils, but only a limited indication of the relative consistency of fine grained soils because the consistency of these soils is significantly influenced by the moisture content.

The subsurface soil samples retrieved in the bore holes were classified in the field based upon visual and textural examination in general accordance with ASTM[1] D-2488. These field classifications were supplemented by subsequent examination and testing of select samples in our laboratory. Graphic logs of the bore holes, including a description of the soil strata encountered, are presented on the Bore Hole Logs, **Figures 2 through 7**, included in the Appendix. Sampling information and other pertinent data and observations are also included on the logs. In addition, a Key to Symbols defining the terms and symbols used on the logs is provided as **Figure 8** in the Appendix.

2.2 Infiltration Testing

Infiltration testing was also performed in bore hole B-6 within natural sand soils. The testing consisted of drilling to 5 feet below the surface, removing the auger, filling the hole with water, allowing it to soak for several hours, then filling the hole again and measuring the rate of water drop over a certain time period (i.e. every 15 minutes). The final measured rate was approximately 1.5 minutes per inch.

[1]American Society for Testing and Materials

3.0 LABORATORY TESTING

Selected samples of the subsurface soils were subjected to various laboratory tests to assess pertinent engineering properties, as follows:

1. Moisture Content, ASTM D-2216, Percent moisture representative of field conditions
2. Dry Density, ASTM D-2937, Dry unit weight representing field conditions
3. Atterberg Limits, ASTM D-4318, Plasticity and workability
4. Gradation Analysis, ASTM D-1140/C-117, Grain Size Analysis

Laboratory test results are presented on the bore hole logs (**Figures 2 through 7**) and in the following Lab Summary Table:

LAB SUMMARY TABLE

Bore Hole	Depth (feet)	Sample Type	Soil Class	Moisture Content (%)	Dry Denstiy (pcf)	Gradation			Atterberg Limits		
						Grav	Sand	Fines	LL	PL	PI
B-1	7	SPT	SC	9				41	30	19	11
	10	Rings	SC	5	121						
	20	SPT	SP-SM	1		18	75	7			
	50	SPT	SM	4				23			
	60	SPT	SM	3						NP	
B-2	5	Rings	SM	4	114			27			
	15	SPT	CL	6					27	19	8
B-3	2.5	SPT	SM	3				29			
	10	SPT	ML	5						NP	
B-4	4	SPT	SM	4				20			
B-5	0	SPT	SM	1				23			

4.0 GEOLOGIC & SEISMIC CONDITIONS

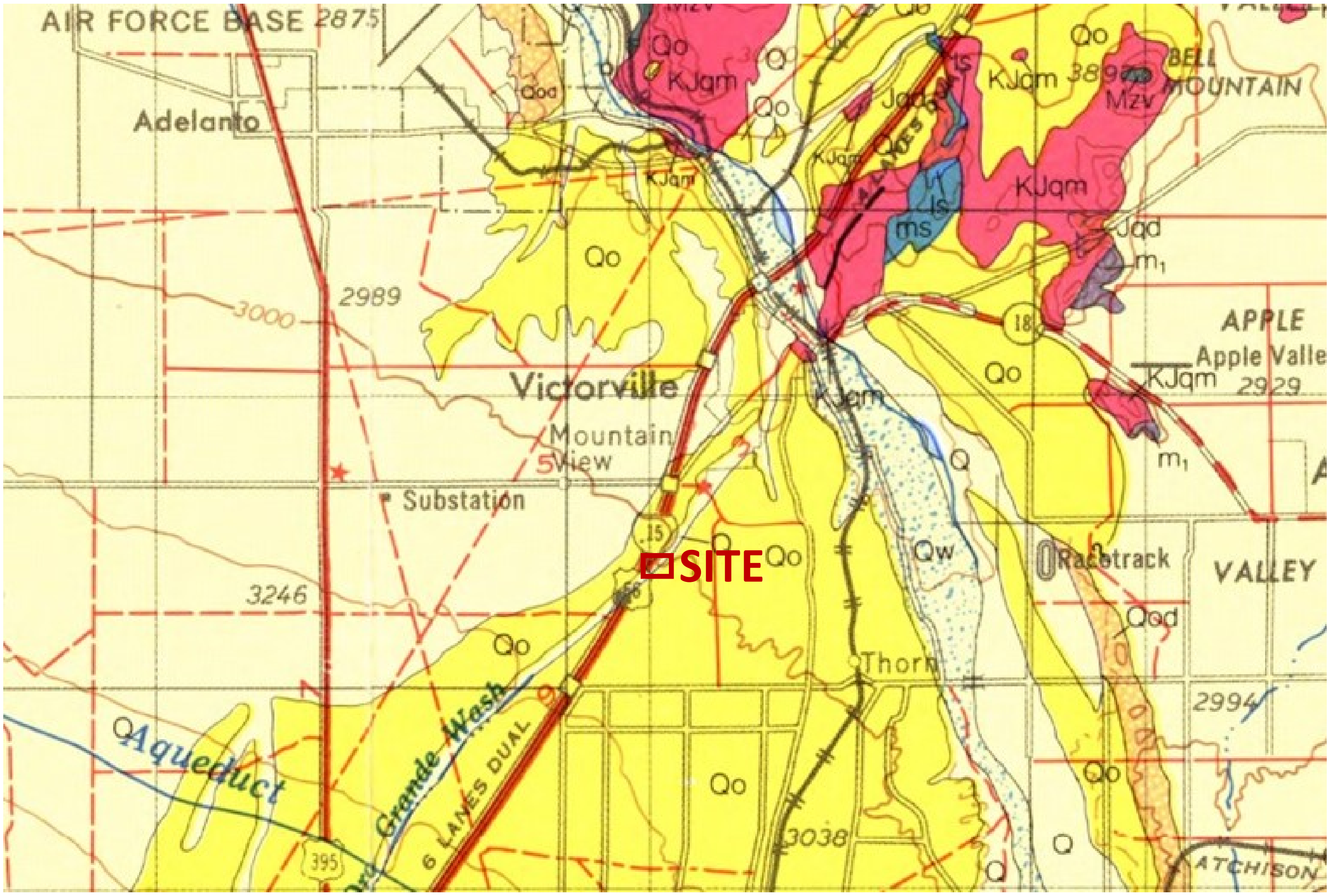
4.1 Geologic Setting

The subject site is located in the western portion of the Mojave Desert Geomorphic Province in southern California. The area of the subject site is a generally broad, flat area with interspersed hilly terrain and relatively low-relief mountains. The San Gabriel Mountains lie to the south of the area. The site sits at an elevation of approximately 3,066 feet above sea level.

The geology of the San Bernardino Sheet of the Geologic Map of California, that includes the location of the subject site, has been mapped by Bortugno and Spittler[2]. The geology at the location of the site and adjacent properties is mapped as "Older alluvium, undifferentiated" (Map Unit Qo) loosely dated as upper Pleistocene.

[2] Rogers, T.H., 1967, Geologic Map of the San Bernardino Quadrangle, California; California Division of Mines and Geology, Regional Geologic Map Series, Map No. 3A, Scale 1:250,000.

The referenced map does not provide a more detailed description of Unit Qo. Refer to the **Geologic Map**., shown below.



GEOLOGIC MAP

4.2 Faulting

An interactive hazards map from the California Geological Survey[3] was reviewed. No fault traces are shown on the referenced geologic map crossing, adjacent to, or projecting toward the subject site. The nearest mapped active (Holocene) fault appears to be the Ord Mountains Fault Zone approximately 9.3 miles to the southeast.

4.3 Seismicity

4.3.1 Site Class

We understand that the State of California Building Code (SCBC) 2019 was adopted on January 1, 2020, which we anticipate will be the code for design of the structures at this site. SCBC 2019 refers to Chapter 20, Site

[3] https://maps.conservation.ca.gov/cgs/DataViewer/

Classification Procedure for Seismic Design, of ASCE[4] 7-16, which stipulates that the average values of shear wave velocity, blow count and/or shear strength within the upper 100 feet (30 meters) be utilized to determine seismic site class. Based on average shear wave velocity data within the upper 30 meters ($V_{S,30}$) provided in the interactive hazards map from the California Geological Survey[3], the subject site has a $V_{S,30}$ of 293 meters per second (961 feet per second), which fits Site Class D. In addition, given the average blow counts and subsurface soils encountered within the maximum depth explored of 71.5 feet at the site, it is our opinion the site best fits Site Class D – Stiff Soil (with data), which we recommend for seismic structural design.

4.3.2 Ground Motions

The seismic mapping utilized by the California Building Code provides values of peak ground, short period and long period spectral accelerations for the Site Class B/C boundary and the Risk-Targeted Maximum Considered Earthquake (MCE_R). This Site Class B/C boundary represents average bedrock values for the Western United States and must be corrected for local soil conditions at site grid coordinates of 34.4861 degrees north latitude and -117.3331 degrees west longitude. The following table summarizes the peak ground, short period and long period accelerations for the MCE_R event, and incorporates appropriate soil correction factors for a Site Class D (with data) soil profile:

SPECTRAL ACCELERATION PERIOD, T	SITE CLASS B/C BOUNDARY [mapped values] (g)	SITE COEFFICIENT	SITE CLASS D* [adjusted for site class effects] (g)	MULTI-PLIER	DESIGN VALUES (g)
Peak Ground Acceleration	PGA = **0.500**	F_{pga} = 1.100	PGA_M = 0.550	1.000	PGA_M = 0.550
0.2 Seconds (Long Period Acceleration)	S_S = **1.247**	F_a = 1.001	S_{MS} = 1.248	0.667	S_{DS} = 0.832
	(no exceptions needed)	F_a = (N/A)	S_{MS} = (N/A)	0.667	S_{DS} = (N/A)
1.0 Second (Long Period Acceleration)	S_1 = **0.482**	F_v = N/A	S_{M1} = N/A	0.667	S_{D1} = N/A
	(Exception 2:)	F_v = (1.818)	S_{M1} = (0.876)	0.667	S_{D1} = (0.584)

NOTES: 1. TL (seconds): **8**
2. Site Class: **D**
3. Have data to verify? **yes**

*** Site Class D With Data**

4. ASCE 7-16 Requires Site-Specific Ground Motion Hazard Analysis (Since S1≥0.2 sec) - OR Can Use Exception 2 (per §11.4.8)

As indicated in the above table, S_1 is greater than 0.2 seconds and a site-specific ground motion hazard analysis (GMHA) is required for the site, unless the Exception 2 values shown are used for seismic design. If a site-specific GMHA is desired instead of using the higher exception values, please contact CMT for a proposal to perform the GMHA.

4.3.3 Liquefaction

Liquefaction is defined as the condition when saturated, loose, sandy soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event. Clayey soils, even if saturated, will generally not liquefy during a major seismic event.

[4] American Society of Civil Engineers

Groundwater was not encountered to the maximum depth explored of 71.5 feet. Based upon this condition, we estimate a very low liquefaction potential or the soils we encountered at this site.

4.4 Other Geologic Hazards

No landslide deposits or features, including lateral spread deposits, are mapped on or adjacent to the site. The site is not located within a known or mapped potential debris flow, stream flooding[5], or rock fall hazard area.

5.0 SITE CONDITIONS

5.1 Surface Conditions

At the time the bore holes were drilled, the site was undeveloped land vegetated with grasses and weeds. The site grade was relatively flat and tens of feet below the adjacent roads. Based on aerial photos dating back to 1993 that are readily available on the internet, Mariposa Road was constructed between 2009 and 2013, and it appears the site grade was lowered as part of the construction. It has since remained undeveloped. The site is bordered on the north by undeveloped land, on the south by Nisqualli Road, on the east by Mariposa Road, and on the west by the northbound Interstate 15 on ramp (see **Vicinity Map** in **Section 1.1** above).

5.2 Subsurface Soils

Approximately 6 inches of sandy topsoil was encountered at the surface across the site. The natural soils encountered below the topsoil predominately consisted of Clayey SAND (SC), Silty SAND (SM), and Poorly Graded SAND with silt (SP-SM) layers. An occasional layer of CLAY (CL) or SILT (ML) was also encountered.

The natural sand soils were slightly moist, red-brown/brown/light brown/light gray-brown in color, and appear to range in relative density from medium dense to very dense based upon the SPT blow counts.

The clay and silt layers were slightly moist to moist, brown to light brown in color, and of medium stiff (estimated) to hard consistency based upon the SPT blow counts.

For a more descriptive interpretation of subsurface conditions, please refer to the bore hole logs, **Figures 2 through 7**, which graphically represent the subsurface conditions encountered. The lines designating the interface between soil types on the log generally represent approximate boundaries; in situ, the transition between soil types may be gradual.

5.3 Groundwater

Groundwater was not encountered to the maximum depth explored of approximately 71.5 feet below the surface. Based upon this condition we do not expect groundwater to be encountered during construction.

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[5] https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd&extent=-111.36752238312305,40.474000783564726,-111.34675135651116,40.48216171946493

Groundwater levels can fluctuate seasonally and in response to numerous factors such as heavy precipitation, irrigation of neighboring land, and other unforeseen factors. The detailed evaluation of these and other factors, which may be responsible for ground water fluctuations, is beyond the scope of this study.

5.4 Site Subsurface Variations

Based on the results of the subsurface explorations and our experience, variations in the continuity and nature of subsurface conditions should be anticipated. Due to the heterogeneous characteristics of natural soils, care should be taken in interpolating or extrapolating subsurface conditions between or beyond the exploratory locations.

6.0 SITE PREPARATION AND GRADING

6.1 General

All deleterious materials should be stripped from the site prior to commencement of construction activities. This includes loose and disturbed soils, topsoil, vegetation, etc. Based upon the conditions observed in the bore holes there is topsoil on the surface of the site which we estimated to be about 6 inches in thickness. When stripping and grubbing, topsoil should be distinguished by the apparent organic content and not solely by color; thus we estimate that topsoil stripping will need to include at least the upper 4 inches.

In pavement areas we recommend that the subgrade be proofrolled by passing moderate-weight rubber tire-mounted construction equipment over the surface at least twice. If excessively soft or loose soils are encountered, they must be removed (up to a maximum depth of 2 feet) and replaced with structural fill. The removed soils may then be replaced as properly moisture conditioned (to within 0 to 2% above optimum moisture) and compacted structural fill, or imported structural fill may be used.

Fill placed over large areas to raise overall site grades can induce settlements in the underlying natural soils. If more than 3 feet of site grading fill is anticipated over the existing ground surface, we should be notified to assess potential settlements and provide additional recommendations as needed. These recommendations may include placement of the site grading fill far in advance to allow potential settlements to occur prior to construction.

6.2 Temporary Excavations

Excavations up to 16 feet deep for the underground fuel storage tanks are anticipated at the site.

For sandy (cohesionless) soils, temporary construction excavations not exceeding 4 feet in depth should be no steeper than one-half horizontal to one vertical (0.5H:1V). For excavations up to 16 feet and above groundwater, side slopes should be no steeper than one horizontal to one vertical (1H:1V). Excavations encountering saturated cohesionless soils will be very difficult to maintain, and will require very flat side slopes and/or shoring, bracing and dewatering.

In clay (cohesive) soils, temporary construction excavations not exceeding 4 feet in depth may be constructed with near-vertical side slopes. Temporary excavations up to 16 feet deep, above or below groundwater, may be constructed with side slopes no steeper than one horizontal to one vertical (1H:1V).

All excavations must be inspected periodically by qualified personnel. If any signs of instability or excessive sloughing are noted, immediate remedial action must be initiated. All excavations should be made following OSHA safety guidelines.

6.3 Fill Material

The table below contains our recommendations for the various fill types we anticipate will be used at this site:

FILL MATERIAL TYPE	DESCRIPTION | RECOMMENDED SPECIFICATION
Structural Fill	Placed below structures, flatwork and pavement. Well-graded sand/gravel mixture, with maximum particle size of 4 inches, a minimum 70% passing 3/4-inch sieve, a maximum 20% passing the No. 200 sieve, and a maximum Plasticity Index of 10.
Site Grading Fill	Placed over larger areas to raise the site grade. Sandy to gravelly soil, with a maximum particle size of 6 inches, a minimum 70% passing 3/4-inch sieve, a maximum 50% passing No. 200 sieve and a maximum Plasticity Index of 15.
Non-Structural Fill	Placed below non-structural areas, such as landscaping. On-site soils or imported soils, with a maximum particle size of 8 inches, including silt/clay soils not containing excessive amounts of degradable/organic material (see discussion below).
Stabilization Fill	Placed to stabilize soft areas prior to placing structural fill and/or site grading fill. Coarse angular gravels and cobbles 1 inch to 8 inches in size. May also use 1.5- to 2.0-inch gravel placed on stabilization fabric, such as Mirafi RS280i or equivalent (see **Section 6.6**).

The natural sand soils (SM, SP-SM) at this site may be suitable for use as structural fill and site grading fill, if found to meet the specifications given above. All on-site soils could be used as non-structural fill but the finer grained soils (CL, ML) could be more difficult to work with. If utilized, these soils should be compacted to the same requirements as imported engineered fill as recommended below.

All fill material should be approved by a geotechnical engineer prior to placement.

6.4 Fill Placement and Compaction

The various types of compaction equipment available have their limitations as to the maximum lift thickness that can be compacted. For example, hand operated equipment is limited to lifts of about 4 inches and most “trench compactors” have a maximum, consistent compaction depth of about 6 inches. Large rollers, depending on soil and moisture conditions, can achieve compaction at 8 to 12 inches. The full thickness of each lift should be compacted to at least the following percentages of the maximum dry density as determined by ASTM D-1557 (or AASHTO[6] T-180) in accordance with the following recommendations:

[6] American Association of State Highway and Transportation Officials

LOCATION	TOTAL FILL THICKNESS (FEET)	MINIMUM PERCENTAGE OF MAXIMUM DRY DENSITY
Beneath an area extending at least 4 feet beyond the perimeter of structures, and below flatwork and pavement (applies to structural fill and site grading fill) extending at least 2 feet beyond the perimeter	0 to 6	95
Site grading fill outside area defined above	0 to 6	92
Utility trenches within structural areas	--	96
Roadbase and subbase	-	96
Non-structural fill	0 to 6	90

Structural fills greater than 6 feet thick are not anticipated at the site. For best compaction results, we recommend that the moisture content for structural fill/backfill be within 2% of optimum. Field density tests should be performed on each lift as necessary to verify that proper compaction is being achieved.

6.5 Utility Trenches

For the bedding zone around the utility, we recommend utilizing sand bedding fill material that meets current local or APWA[7] requirements.

All utility trench backfill material below structurally loaded facilities (foundations, floor slabs, flatwork, parking lots/drive areas, etc.) should be placed at the same density requirements established for structural fill in the previous section.

Most utility companies and local governments are requiring Type A-1a or A-1b (AASHTO Designation) soils (sand/gravel soils with limited fines) be used as backfill over utilities within public rights of way, and the backfill be compacted over the full depth above the bedding zone to at least 96% of the maximum dry density as determined by AASHTO T-180 (ASTM D-1557).

6.6 Stabilization

If rutting or pumping occurs, traffic should be stopped and the disturbed soils should be removed and replaced with stabilization material. Typically, a minimum of 18 inches of the disturbed soils must be removed to be effective. However, deeper removal is sometimes required.

To stabilize soft subgrade conditions a mixture of coarse, clean, angular gravels and cobbles and/or 1.5- to 2.0-inch clean gravel should be utilized. Often the amount of gravelly material can be reduced with the use of a geotextile fabric such as Mirafi RS280i, or equivalent. Its use will also help avoid mixing of the subgrade soils with the gravelly material. After excavating the soft/disturbed soils, the fabric should be spread across the bottom of the excavation and up the sides a minimum of 18 inches. Otherwise, it should be placed in accordance

[7] American Public Works Association

with the manufacturer's recommendation, including proper overlaps. The gravel material can then be placed over the fabric in compacted lifts as described above.

7.0 FOUNDATION RECOMMENDATIONS

The following recommendations have been developed on the basis of the previously described project characteristics, the subsurface conditions observed in the field and the laboratory test data, as well as common geotechnical engineering practice.

7.1 Foundation Recommendations

Based on our geotechnical engineering analyses, the proposed structures may be supported upon conventional spread and/or continuous wall foundations placed entirely on suitable undisturbed natural sand soils, or entirely on structural fill extending to undisturbed natural soils. Footings may be designed using a net bearing pressure of 2,000 psf. The term "net bearing pressure" refers to the pressure imposed by the portion of the structure located above lowest adjacent final grade, thus the weight of the footing and backfill to lowest adjacent final grade need not be considered. The allowable bearing pressure may be increased by 1/3 for temporary loads such as wind and seismic forces.

We also recommend the following:

1. Exterior footings subject to frost should be placed at least 12 inches below final grade.
2. Interior footings not subject to frost should be placed at least 8 inches below grade.
3. Continuous footing widths should be maintained at a minimum of 18 inches.
4. Spot footings should be a minimum of 24 inches wide.

7.2 Installation

Under no circumstances shall foundations be placed on non-engineered fill (if encountered), topsoil with organics, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. If unsuitable soils are encountered, they must be completely removed and replaced with properly compacted structural fill. The base of footing excavations and floor slab sub grades should be observed by a qualified geotechnical engineer to confirm that suitable bearing soils have been exposed.

All structural fill should meet the requirements for such, and should be placed and compacted in accordance with **Section 6** above. The width of structural replacement fill below footings should be equal to the width of the footing plus 1 foot for each foot of fill thickness. For instance, if the footing width is 2 feet and the structural fill depth beneath the footing is 4 feet, the fill replacement width should be 6 feet, centered beneath the footing.

The minimum thickness of structural fill below footings should be equivalent to one-third the thickness of structural fill below any other portion of the foundations. For example, if the maximum depth of structural fill is 6 feet, all footings for the new structure should be underlain by a minimum 2 feet of structural fill.

7.3 Estimated Settlement

Foundations designed and constructed in accordance with our recommendations could experience some settlement, but we anticipate that total settlements of footings founded as recommended above will not exceed 1 inch. We project that approximately 50% of the total settlement will initially take place during construction.

7.4 Lateral Resistance

Lateral loads imposed upon foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footings and the supporting soils. In determining frictional resistance, a coefficient of 0.40 for structural fill, may be utilized for design. Passive resistance provided by properly placed and compacted structural fill above the water table may be considered equivalent to a fluid with a density of 425 pcf. A combination of passive earth resistance and friction may be utilized if the friction component of the total is divided by 1.5.

8.0 LATERAL EARTH PRESSURES

We anticipate that below-grade walls up to 4 feet high may be constructed at this site. The lateral earth pressure values given in the table below are for a backfill material that will consist of drained sand/gravel soils (less than 10% passing No. 200 sieve) placed and compacted in accordance with the recommendations presented herein. If other soil types will be used as backfill, we should be notified so that appropriate modifications to these values can be provided, as needed.

The lateral pressures imposed upon subgrade facilities will depend upon the relative rigidity and movement of the backfilled structure. Following are the recommended lateral pressure values, which also assume that the soil surface behind the wall is horizontal and that the backfill within 3 feet of the wall will be compacted with hand-operated compacting equipment.

CONDITION	STATIC (psf/ft)*	SEISMIC (psf)**
Active Pressure (wall is allowed to yield, i.e. move away from the soil, with a minimum 0.001H movement/rotation at the top of the wall, where "H" is the total height of the wall)	35	52
At-Rest Pressure (wall is not allowed to yield)	55	138
Passive Pressure (wall moves into the soil)	425	425

*Equivalent Fluid Pressure (applied at 1/3 Height of 4-foot High Wall)
**Uniform Pressure, Seismic Only (applied at 1/2 Height of 4-foot High Wall)

9.0 BOUYANT FORCES

Groundwater was not encountered in our explorations. Based upon this condition we anticipate that underground tanks will not need to be designed to resist buoyant forces.

10.0 FLOOR SLABS

Floor slabs may be supported on suitable, undisturbed natural sand soils, or on structural fill extending to natural soils (same as for foundations). Under no circumstances shall floor slabs be established directly on any topsoil, non-engineered fills, loose or disturbed soils, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water.

In order to facilitate curing of the concrete, we recommend that floor slabs placed on structural fill be directly underlain by at least 4 inches of “free-draining” fill, such as “pea” gravel or 3/4-inch quarters to 1-inch minus, clean, gap-graded gravel. To help control normal shrinkage and stress cracking, the floor slabs should have the following features:

1. Adequate reinforcement for the anticipated floor loads with the reinforcement continuous through interior floor joints;
2. Frequent crack control joints; and
3. Non-rigid attachment of the slabs to foundation walls and bearing slabs.

11.0 DRAINAGE RECOMMENDATIONS

It is important to the long-term performance of foundations and floor slabs that water not be allowed to collect near the foundation walls and infiltrate into the underlying soils. We recommend the following:

1. All areas around the structures should be sloped to provide drainage away from the foundations. We recommend a minimum slope of 4 inches in the first 10 feet away from the structure. This slope should be maintained throughout the lifetime of the structure.

2. All roof drainage should be collected in rain gutters with downspouts designed to discharge at least 10 feet from the foundation walls or well beyond the backfill limits, whichever is greater.

3. Adequate compaction of the foundation backfill should be provided. We suggest a minimum of 90% of the maximum laboratory density as determined by ASTM D-1557. Water consolidation methods should not be used under any circumstances.

4. Landscape sprinklers should be aimed away from the foundation walls. The sprinkling systems should be designed with proper drainage and be well-maintained. Over watering should be avoided.

5. Other precautions that may become evident during construction.

12.0 PAVEMENTS

All pavement areas must be prepared as discussed above in **Section 6.1**. Under no circumstances shall pavements be established over topsoil, non-engineered fill, loose or disturbed soils, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water.

We anticipate the near surface sand soils will exhibit fair pavement support characteristics when saturated or nearly saturated. Based on our laboratory testing experience with similar soils, our pavement design is based upon a Resistance (R) value of about 8 (approximate California Bearing Ratio of 40).

Given the projected traffic as discussed above in **Section 1.3**, the following pavement sections are recommended for the estimated Traffic Indices (TI):

MATERIAL	PAVEMENT SECTION THICKNESS (INCHES)					
	PARKING AREAS (T.I. = 5.0)			DRIVE/TRUCK AREAS (T.I. = 9.0)		
Asphalt	3	3	---	6	6	---
Concrete	---	--	5	---	---	7
Road-Base	10	6	6	9	6	8
Subbase	0	6	0	0	6	0
Total Thickness	13	15	11	15	18	15

Untreated base course (UTBC) should conform to city or Caltrans specifications. Material meeting our specification for structural fill can be used for subbase, as long as the fines content (percent passing No. 200 sieve) does not exceed 15%. Roadbase and subbase material should be compacted as recommended above in **Section 6.4**. Asphalt material generally should conform to Caltrans or APWA requirements.

Concrete pavement should be designed in accordance with the American Concrete Institute (ACI) and joint details should conform to the Portland Cement Association (PCA) guidelines. The concrete should have a minimum 28-day unconfined compressive strength of 4,000 pounds per square inch.

13.0 QUALITY CONTROL

We recommend that a comprehensive quality control testing and observation program be established during construction to help facilitate implementation of our recommendations and address, in a timely manner, any subsurface conditions encountered which vary from those described in this report. Without such a program CMT cannot be responsible for application of our recommendations to subsurface conditions which may vary from those described herein. This program may include, but not necessarily be limited to, the following:

13.1 Field Observations

Observations should be completed during all phases of construction such as site preparation, foundation excavation, structural fill placement and concrete placement.

13.2 Fill Compaction

Compaction testing is required for all structural supporting fill materials. Maximum Dry Density (Modified Proctor, ASTM D-1557) tests should be requested by the contractor immediately after delivery of any fill materials. The maximum density information should then be used for field density tests on each lift as necessary to ensure that the required compaction is being achieved.

13.3 Excavations

All excavation procedures and processes should be observed by a geotechnical engineer. In addition, for the recommendations in this report to be valid, all backfill and structural fill placed in trenches and all pavements should be density tested. We recommend that freshly mixed concrete be tested in accordance with ASTM designations.

14.0 LIMITATIONS

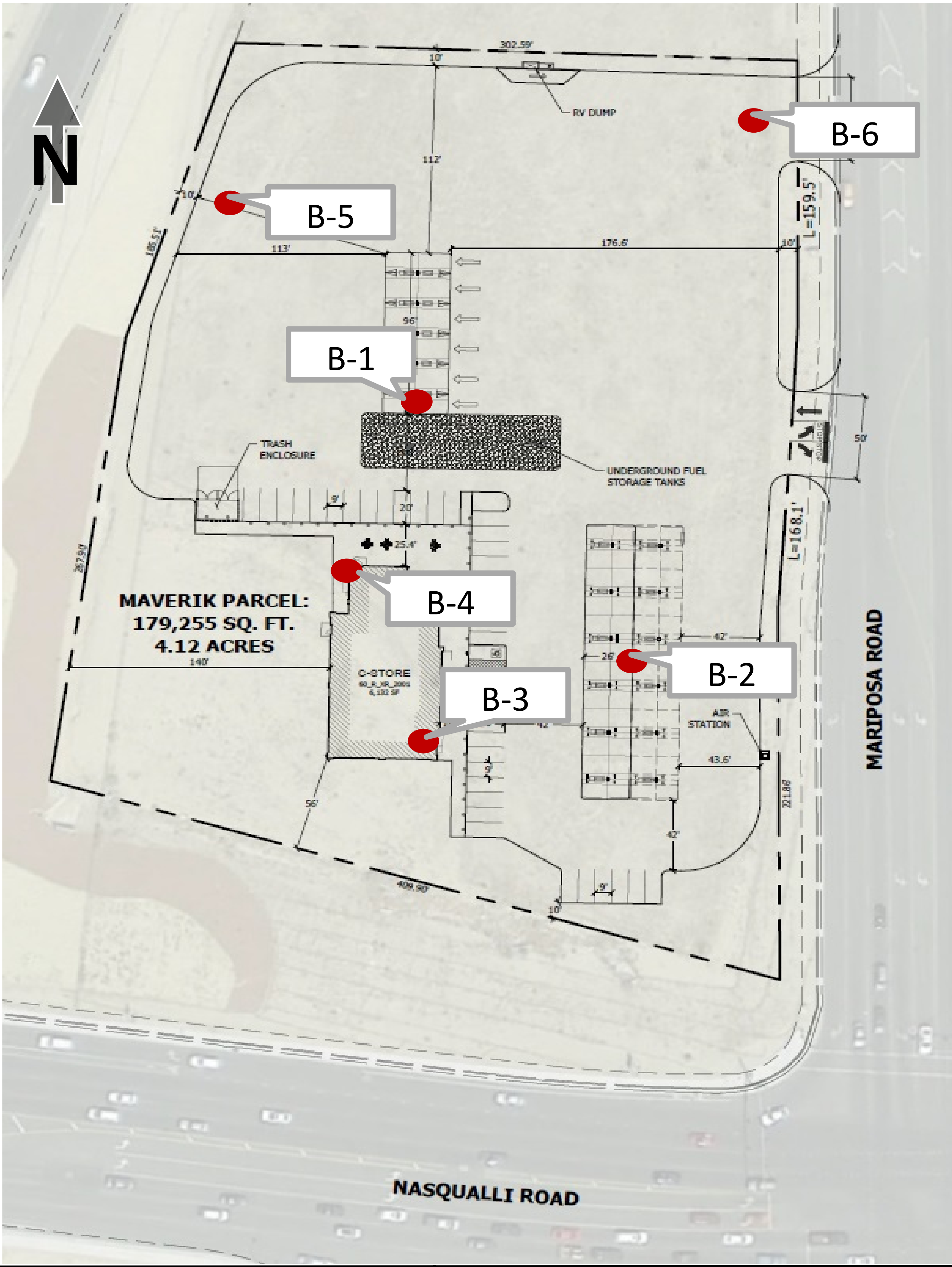
The recommendations provided herein were developed by evaluating the information obtained from the subsurface explorations and soils encountered therein. The exploration logs reflect the subsurface conditions only at the specific location at the particular time designated on the logs. Soil and ground water conditions may differ from conditions encountered at the actual exploration locations. The nature and extent of any variation in the explorations may not become evident until during the course of construction. If variations do appear, it may become necessary to re-evaluate the recommendations of this report after we have observed the variation.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

We appreciate the opportunity to be of service to you on this project. If we can be of further assistance or if you have any questions regarding this project, please do not hesitate to contact us at (801) 492-4132.

APPENDIX

SUPPORTING
DOCUMENTATION



Maverik Store	CMT ENGINEERING LABORATORIES			Figure:
NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA	Site Plan	Date:	9-Sep-20	1
		Job #	15198	

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-1

Total Depth: 71.5'
Water Depth: (see Remarks)

Date: 8/22/20
Job #: 15198

Depth (ft)	Soil Description	Sample #	Blows (N)	Total	Moisture (%)	Dry Density (pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0	TOPSOIL: Sand, silt, roots, organics, slighty moist, brown											
	Silty SAND (SM), slightly moist, red-brown											
	medium dense	1	4 5 6	11								
4												
	dense	2	7 13 20	33								
	Clayey SAND (SC), slightly moist, brown — dense	3	12 21 28	49	9				41	30	19	11
8												
	very dense	4	37 50/5"	50+	5	121						
12												
		5	17 24 28	52								
16												
20	Poorly Graded SAND with silt (SP-SM), slightly moist, light gray-brown — dense	6	9 16 22	38	1		18	75	7			
24												
		7	13 17 21	38								
28												

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 2

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-1

Total Depth: 71.5'
Water Depth: (see Remarks)

Date: 8/22/20
Job #: 8/10/41

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
28	Poorly Graded SAND with silt (SP-SM), slightly moist, light gray-brown												
	dense		8	8 15 24	39								
32													
	Silty SAND (SM), slightly moist, light brown — medium dense		9	8 12 17	29								
36													
40			10	8 15 17	32								
44			11	8 12 17	29								
48													
	dense		12	12 19 28	47	4				23			
52													
56			13	13 22	46								

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 2

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-1

Total Depth: 71.5'
Water Depth: (see Remarks)

Date: 8/22/20
Job #: 8/10/41

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
56	Silty SAND (SM), slightly moist, light brown			24									
60	dense		14	10 19 25	44	3						NP	NP
64			15	11 18 24	42								
68	very dense		16	14 24 28	52								
72	END AT 71.5 FEET												
76													
80													
84													

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 2

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-2

Total Depth: 16.5'
Water Depth: (see Remarks)

Date: 8/22/20
Job #: 15198

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Blows (N) Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0	TOPSOIL: Sand, silt, roots, organics, slighty moist, brown												
	Silty SAND (SM), slightly moist, red-brown												
	medium dense		17	6 12 15	27								
4													
	very dense		18	38 50/3"	50+	4	114			27			
8			19	15 30 36	66								
	medium dense		20	16 28									
12													
	Sandy CLAY (CL), moist, brown; blow counts not recorded; medium stiff?		21			6					27	19	8
16	END AT 16.5 FEET												
20													
24													
28													

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 3

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-3

Total Depth: 11.5'
Water Depth: (see Remarks)
Date: 8/22/20
Job #: 15198

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Blows Total	Moisture (%)	Dry Density (pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0	TOPSOIL: Sand, silt, roots, organics, slightly moist, brown												
	Silty SAND (SM), slightly moist, red-brown												
	very dense		22	15 30 31	61	3				29			
4													
	dense		23	12 19 20	39								
	Sandy SILT (ML), slightly moist, light brown hard												
8			24	13 32 43	75								
			25	9 12 20	32	5						NP	NP
12	END AT 11.5 FEET												
16													
20													
24													
28													

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 4

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-4

Total Depth: 11'
Water Depth: (see Remarks)
Date: 8/22/20
Job #: 15198

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Sand %	Fines %	Atterberg: LL	PL	PI
0	TOPSOIL: Sand, silt, roots, organics, slightly moist, brown												
	Silty SAND (SM), slightly moist, red-brown												
	medium dense		26	3 5 8	13								
4	dense		27	11 20 25	45	4				20			
8	very dense		28	18 21 32	53								
	dense		29	16 21 24	45								
	END AT 11.0 FEET												
12													
16													
20													
24													
28													

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 5

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-5

Total Depth: 5'
Water Depth: (see Remarks)

Date: 8/22/20
Job #: 15198

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)	Blows (N) Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0		TOPSOIL: Sand, silt, roots, organics, slightly moist, brown												
		Silty SAND (SM), slightly moist, red-brown loose		30	4 4 4	8	1				23			
		medium dense		31	3 6 10	16								
4														
		END AT 5.0 FEET												
8														
12														
16														
20														
24														
28														

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 6

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-6

Total Depth: 5'
Water Depth: (see Remarks)
Date: 8/22/20
Job #: 15198

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)	Blows (N) Total	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL: Sand, silt, roots, organics, slightly moist, brown												
		Silty SAND (SM), slightly moist, red-brown												
		medium dense		32	6 10 11	21								
4		dense		33	9 14 18	32								
		END AT 5.0 FEET												
8														
12														
16														
20														
24														
28														

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 7

Maverik Store

Key to Symbols

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Date: 8/22/20

Job #: 15198

①	②	③	④	⑤	Blows(N) ⑥	⑦	⑧	⑨	Gradation ⑩			Atterberg ⑪		
Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #		Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI

COLUMN DESCRIPTIONS

① **Depth (ft.):** Depth (feet) below the ground surface (including groundwater depth - see water symbol below).

② **Graphic Log:** Graphic depicting type of soil encountered (see ② below).

③ **Soil Description:** Description of soils encountered, including Unified Soil Classification Symbol (see below).

④ **Sample Type:** Type of soil sample collected at depth interval shown; sampler symbols are explained below-right

⑤ **Sample #:** Consecutive numbering of soil samples collected during field exploration.

⑥ **Blows:** Number of blows to advance sampler in 6" increments, using a 140-lb hammer with 30" drop.

⑦ **Total Blows:** Number of blows to advance sampler the 2nd and 3rd 6" increments.

⑧ **Moisture (%):** Water content of soil sample measured in laboratory (percentage of dry weight of sample).

⑨ **Dry Density (pcf):** The dry density of a soil measured in laboratory (pounds per cubic foot).

⑩ **Gradation:** Percentages of Gravel, Sand and Fines (Silt/Clay), obtained from lab test results of soil passing the No. 4 and No. 200 sieves.

⑪ **Atterberg:** Individual descriptions of Atterberg Tests are as follows:

LL = Liquid Limit (%): Water content at which a soil changes from plastic to liquid behavior.

PL = Plastic Limit (%): Water content at which a soil changes from liquid to plastic behavior.

PI = Plasticity Index (%): Range of water content at which a soil exhibits plastic properties (= Liquid Limit - Plastic Limit).

STRATIFICATION	
Description	**Thickness**
Seam	Up to ½ inch
Lense	Up to 12 inches
Layer	Greater than 12 in.
Occasional	1 or less per foot
Frequent	More than 1 per foot

MODIFIERS
Trace
<5%
Some
5-12%
With
> 12%

MOISTURE CONTENT
Dry: Absence of moisture, dusty, dry to the touch.
Moist: Damp / moist to the touch, but no visible water.
Saturated: Visible water, usually soil below groundwater.

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS			USCS SYMBOLS	②	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS More than 50% of material is larger than No. 200 sieve size.	GRAVELS The coarse fraction retained on No. 4 sieve.	CLEAN GRAVELS (< 5% 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 (≥ 12% fines)	GM		Silty Gravels, Gravel-Sand-Silt Mixtures
			GC		Clayey Gravels, Gravel-Sand-Clay Mixtures
	SANDS The coarse fraction passing through No. 4 sieve.	CLEAN SANDS (< 5% fines)	SW		Well-Graded Sands, Gravelly Sands, Little or No Fines
			SP		Poorly-Graded Sands, Gravelly Sands, Little or No Fines
		SANDS WITH FINES (≥ 12% 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, Silty or Clayey Fine Sands or Clayey Silts with Slight
			CL		Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean
			OL		Organic Silts and Organic Silty Clays o f Low Plasticity
	SILTS AND CLAYS Liquid Limit greater than 50%		MH		Inorganic Silts, Micacious or Diatomacious Fine Sand or Silty Soils with Plasticity (Elastic Silts)
			CH		Inorganic Clays of High Plasticity, Fat Clays
			OH		Organic Silts and Organic Clays of Medium to High Plasticity
HIGHLY ORGANIC SOILS			PT		Peat, Humus, Swamp Soils with High Organic Contents

Note: Dual Symbols are used to indicate borderline soil classifications (i.e. GP-GM, SC-SM, etc.).

SAMPLER SYMBOLS

- Block Sample
- Bulk/Bag Sample
- Modified California Sampler 3.5" OD, 2.42" ID
- D&M Sampler
- Rock Core
- Standard Penetration Split Spoon Sampler
- Thin Wall (Shelby Tube)

WATER SYMBOL

- Encountered Water Level
- Measured Water Level

(see Remarks on Logs)

1. The results of laboratory tests on the samples collected are shown on the logs at the respective sample depths.
2. The subsurface conditions represented on the logs are for the locations specified. Caution should be exercised if interpolating between or extrapolating beyond the exploration locations.
3. The information presented on each log is subject to the limitations, conclusions, and recommendations presented in this report.

CMT ENGINEERING LABORATORIES

Figure: 8

Appendix F – Water Quality Management Plan

MOJAVE RIVER WATERSHED

Water Quality Management Plan

For:

Victorville Nisqualli

APN: 3092-311-09, 3092-311-10

Prepared for:

Paul Heywood

Maverik, Inc.

185 South State Street, Suite 800

Salt Lake City, UT 84111

(801) 936 - 5557

Prepared by:

Kimley-Horn and Associates, Inc.

3880 Lemon Street Suite 420

Riverside, CA 92501

(951) 543-9868

Submittal Date: January, 14, 2021

Revision No. and Date: Insert No and Current Revision Date

Revision No. and Date: Insert No and Current Revision Date

Revision No. and Date: Insert No and Current Revision Date

Revision No. and Date: Insert No and Current Revision Date

Revision No. and Date: Insert No and Current Revision Date

Final Approval Date:_____________________

Project Owner's Certification

This Mojave River Watershed Water Quality Management Plan (WQMP) has been prepared for Maverik by Kimley-Horn and Associates, Inc. The WQMP is intended to comply with the requirements of the City of Victorville and the Phase II Small MS4 General Permit for the Mojave River Watershed. 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 the Phase II Small MS4 Permit and the intent of San Bernardino County (unincorporated areas of Phelan, Oak Hills, Spring Valley Lake and Victorville) and the incorporated cities of Hesperia and Victorville and the Town of Apple Valley. Once the undersigned transfers its interest in the property, its successors in interest and the city/county/town 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):		Grading Permit Number(s):	
Tract/Parcel Map Number(s):		Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			

Owner's Signature			
Owner Name: Paul Heywood			
Title	St. Real Estate Development Manager		
Company	Maverik, Inc.		
Address	185 South State Street, Suite 800		
Email			
Telephone #	(801) 936 - 5557		
Signature		Date	

Preparer's Certification

Project Data			
Permit/Application Number(s):		Grading Permit Number(s):	
Tract/Parcel Map Number(s):		Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			

"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 the California State Water Resources Control Board Order No. 2013-0001-DWQ.

Engineer:	Shea-Michael Anti, P.E.	PE Stamp Below
Title	Principal Engineer	REGISTERED PROFESSIONAL ENGINEER SHEA-MICHAEL ANTI RCE NO. 78274 CIVIL STATE OF CALIFORNIA
Company	Kimley-Horn and Associates, Inc.	
Address	3880 Lemon Stree, Ste 420, Riverside, CA 92501	
Email	shea.anti@kimley-horn.com	
Telephone #	(951) 335-8272	
Signature		
Date	01/14/2021	

Table of Contents

Forms

Section I – Introduction

This WQMP template has been prepared specifically for the Phase II Small MS4 General Permit in the Mojave River Watershed. This location is within the jurisdiction of the Lahontan Regional Water Quality Control Board (LRWQCB). This document should not be confused with the WQMP template for the Santa Ana Phase I area of San Bernardino County.

WQMP preparers must refer to the MS4 Permit for the Mojave Watershed WQMP template and Technical Guidance (TGD) document found at: http://cms.sbcounty.gov/dpw/Land/NPDES.aspx to find pertinent arid region and Mojave River Watershed specific references and requirements.

Section 1 Discretionary Permit(s)

Form 1-1 Project Information

Project Name	Victorville Nisqualli				
Project Owner Contact Name:	Paul Heywood/Maverik, Inc.				
Mailing Address: 185 South State Street Suite 800, Salt Lake City, UT 84111		E-mail Address:		Telephone:	(801) 936 - 5557
Permit/Application Number(s):		Tract/Parcel Map Number(s):	3092-311-09, -10		
Additional Information/ Comments:					
Description of Project:	The proposed project is located at the northwest corner of Nisqualli Road and Mariposa Road in the City of Victorville, County of San Bernardino, California. The proposed project consists of a 6,112 square foot C-store, a fueling canopy for automobiles, a fueling canopy for trucks, and associated fueling appurtenances, landscaping, concrete hardscape, and asphalt paving. The associated improvements include, but are not limited to onsite and offsite grading, domestic water service, sanitary sewer service, storm drain infrastructure, street improvements, concrete and asphalt pavement, landscaping and irrigation. The proposed development is approximately 5.23 acres. The proposed building use will be commercial, as it will contain a restaurant and other truck stop facilities. The site is currently undeveloped and is 100% pervious. Once the site is developed the site will be 24% pervious and 76% impervious.				

Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.	N/A

Section 2 Project Description

2.1 Project Information

The WQMP shall 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.

2.1.1 Project Sizing Categorization

If the Project is greater than 5,000 square feet, and not on the excluded list as found on Section 1.4 of the TGD, the Project is a Regulated Development Project.

If the Project is creating and/or replacing greater than 2,500 square feet but less than 5,000 square feet of impervious surface area, then it is considered a Site Design Only project. This criterion is applicable to all development types including detached single family homes that create and/or replace greater than 2,500 square feet of impervious area and are not part of a larger plan of development.

<table>
<tr><th colspan="6">Form 2.1-1 Description of Proposed Project</th></tr>
<tr><td colspan="6">1 Regulated Development Project Category (Select all that apply):</td></tr>
<tr><td colspan="2">☐ #1 New development involving the creation of 5,000 ft² or more of impervious surface collectively over entire site</td><td>☒ #2 Significant re-development involving the addition or replacement of 5,000 ft² or more of impervious surface on an already developed site</td><td colspan="2">☐ #3 Road Project – any road, sidewalk, or bicycle lane project that creates greater than 5,000 square feet of contiguous impervious surface</td><td>☐ #4 LUPs – linear underground/overhead projects that has a discrete location with 5,000 sq. ft. or more new constructed impervious surface</td></tr>
<tr><td colspan="6">☐ Site Design Only (Project Total Square Feet > 2,500 but < 5,000 sq.ft.) Will require source control Site Design Measures. Use the “PCMP” Template. Do not use this WQMP Template.</td></tr>
<tr><td>2 Project Area (ft2):</td><td>227,891</td><td>3 Number of Dwelling Units:</td><td>0</td><td>4 SIC Code:</td><td>5441</td></tr>
<tr><td colspan="6">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.</td></tr>
</table>

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:
The project is owned by Maverik, Inc. All proposed onsite storm drain pipes, and infiltration systems will be owned and maintained by Maverik, Inc.

2.3 Potential Stormwater Pollutants

Best Management Practices (BMP) measures for pollutant generating activities and sources shall be designed consistent with recommendations from the CASQA Stormwater BMP Handbook for New Development and Redevelopment (or an equivalent manual). Pollutant generating activities must be considered when determining the overall pollutants of concern for the Project as presented in Form 2.3-1.

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-2 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 ☐	Pathogens can be expected to be a pollutant of concern for stormwater runoff due to food operations and associated trash. Trash receptacles are proposed.
Nutrients - Phosphorous	E ☒	N ☐	The Nutrient Phosphorous can be expected to be a pollutant of concern for stormwater runoff due to landscape operations
Nutrients - Nitrogen	E ☒	N ☐	The Nutrient Phosphorous can be expected to be a pollutant of concern for stormwater runoff due to landscape operations
Noxious Aquatic Plants	E ☐	N ☒	N/A
Sediment	E ☒	N ☐	Resulting from limited air and hydrological transport of sediments both on and around the subject site
Metals	E ☒	N ☐	Resulting from automobiles parking and queuing in the drive-thru lane
Oil and Grease	E ☒	N ☐	Resulting from automobiles parking and queuing in the drive-thru lane
Trash/Debris	E ☒	N ☐	Trash enclosure proposed
Pesticides / Herbicides	E ☒	N ☐	Expected to be used in landscaping
Organic Compounds	E ☒	N ☐	Pathogens can be expected to be a pollutant of concern for stormwater runoff due to food operations and associated trash. Trash receptacles are proposed.
Other:	E ☐	N ☒	
Other:	E ☐	N ☒	
Other:	E ☐	N ☒	

Section 3 Site and Watershed Description

Describe the project site conditions that will facilitate the selection of BMPs 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 Drainage Management Areas (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. A map presenting the DMAs must be included as an appendix to the WQMP document.***

Form 3-1 Site Location and Hydrologic Features

Site coordinates *take GPS measurement at approximate center of site*	Latitude 34.485726	Longitude -117.332835	Thomas Bros Map page
1 San Bernardino County climatic region: ☒ Desert			
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
DA1 DMA C flows to DA1 DMA A	*Ex. Bioretention overflow to vegetated bioswale with 4' bottom width, 5:1 side slopes and bed slope of 0.01. Conveys runoff for 1000' through DMA 1 to existing catch basin on SE corner of property*
DA1 DMA A to Outlet 1	Drainage from DA 1 (referred to as DA A in the hydrology map) generally flows in the westerly direction and enters an infiltration system via a curb cut on the southwest corner of the site.
DA1 DMA B to Outlet 1	
DA2 to Outlet 2	Drainage from DA 2 (referred to as DA B in the hydrology map) generally flows in the northerly direction and enters an infiltration basin along the north perimeter of the project before entering an underground ADS SotrmTech MC-4500 system.

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)	29625		N/A	N/A
2 Existing site impervious area (ft^2)	0			
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	II			
4 Hydrologic soil group *Refer to County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf*	A			
5 Longest flowpath length (ft)	247			
6 Longest flowpath slope (ft/ft)	0.008			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Barren			
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***	Poor			

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 2

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)	171857		N/A	N/A
2 Existing site impervious area (ft^2)	0			
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	II			
4 Hydrologic soil group *Refer to County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf*	A			
5 Longest flowpath length (ft)	694			
6 Longest flowpath slope (ft/ft)	0.18			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Barren			
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***	Poor			

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)	N/A	N/A	N/A	N/A
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 *County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf*				
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 SWRCB site: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	Mojave River (receiving water is below the narrows)
Applicable TMDLs *http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml*	No applicable TMDLS are applicable
303(d) listed impairments *http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml*	N/A
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP*	N/A
Hydromodification Assessment	☒ Yes *Complete Hydromodification Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-9 in submittal* ☐ No

Section 4 Best Management Practices (BMP)

4.1 Source Control BMPs and Site Design BMP Measures

The information and data in this section are required for both Regulated Development and Site Design Only Projects. Source Control BMPs and Site Design BMP Measures are the basis of site-specific pollution management.

4.1.1 Source Control BMPs

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.

The identified list of source control BMPs correspond to the CASQA Stormwater BMP Handbook for New Development and Redevelopment.

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	☒	☐	Education Material included in Attachment E of this document will be provided to Property Owners, Tenants and Occupants when taking possession of property.
N2	Activity Restrictions	☒	☐	Pursuant to the Education Material included in Attachment E of this document, the User of the facility will be notified upon possession of the property of all activities that are restricted and or limited and the education material shall be referenced in all lease documents.
N3	Landscape Management BMPs	☒	☐	Leasing documents will require user of property to adhere to Landscape management BMPs listed in the Education Material in Attachment E of this document.
N4	BMP Maintenance	☒	☐	Owner will be responsible for maintain all BMPs per the appropriate O&M and as outlined in the Educational Material included win Attachment E of this document.
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	Owner will be responsible for maintain all BMPs per the appropriate O&M and as outlined in the Educational Material included win Attachment E of this document.
N6	Local Water Quality Ordinances	☐	☒	No known local water quality ordinances.
N7	Spill Contingency Plan	☐	☐	Owner will prepare spill contingency plan and educate all employees on said plan.
N8	Underground Storage Tank Compliance	☒	☐	Fuel dispensing area are proposed.Appropriate measures shall be taken to prevent spillages from underground tanks.
N9	Hazardous Materials Disclosure Compliance	☒	☐	A gasoline outlet is proposed as part of the project. Appropriate hazardous waste disclosures and sign will be posted where applicable.

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	☐	☒	Proposed site compliant with Article 80 of the Uniform Fire Code, does not require fire sprinkler system.
N11	Litter/Debris Control Program	☒	☐	See Section 5 for BMP inspection, maintenance and frequency of litter and debris control. See Attachment E for material on litter and debris control.
N12	Employee Training	☒	☐	See Attachment E for BMP specific employee training and Section 5 for post construction BMP training.
N13	Housekeeping of Loading Docks	☐	☒	Loading docks not proposed.
N14	Catch Basin Inspection Program	☒	☐	See Appendix C for BMP inspection, maintenance and frequency of litter and debris control.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	See Road and Maintenance (SC-70) and Parking/Storage Maintenance (SC-43) in Attachment F for sweeping requirements.
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	No non-structural measures for public agency projects.
N17	Comply with all other applicable NPDES permits	☒	☐	Proposed site will comply with all NPDES permits.

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)	☒	☐	Stencilling and signage will be provided.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	No Outdoor Storage.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	Covered Trash Enclosure Proposed. Inspection and maintenance outlined in Form 5-1.
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)	☒	☐	Proposed site follows irrigation requirements described in CASQA New Development BMP SD-12. See Attachment E.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	Proposed site has finished grade of landscape area at a minimum of 1-2 inches below top of curb, sidewalk, and pavement.
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☐	☒	Slopes/channels not expected.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☐	☒	No docks.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	No maintenance bays.
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No wash areas have been proposed.
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☒	☐	No outdoor processing

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)	☒	☐	Proposed site follows equipment washing requirements described in CASQA New Development BMP SD-33. See Attachment E. Spill contingency plan prepared by owner for employees.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☒	☐	Runoff will be diverted away from fueling areas
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	No hillside.
S14	Wash water control for food preparation areas	☐	☒	All food preparation will be indoors and fulle enclosed/contained.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	No community cas wash racks

4.1.2 Site Design BMPs

As part of the planning phase of a project, the site design practices associated with new LID requirements in the Phase II Small MS4 Permit must be considered. Site design BMP measures can result in smaller Design Capture Volume (DCV) to be managed by both LID and hydromodification control BMPs by reducing runoff generation.

As is stated in the Permit, it is necessary to evaluate site conditions such as soil type(s), existing vegetation and flow paths will influence the overall site design.

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 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: Landscape areas will be maximized on site
Maximize natural infiltration capacity; Including improvement and maintenance of soil: Yes ☒ No ☐ Explanation: Yes, an undergorund infiltration system is proposed for the project to maximize natural infiltration capacity.
Preserve existing drainage patterns and time of concentration: Yes ☐ No ☐ Explanation: Natural drainage patterns will be maintained
Disconnect impervious areas. Including rerouting of rooftop drainage pipes to drain stormwater to storage or infiltration BMPs instead of to storm drain : Yes ☒ No ☐ Explanation: Maximized
Use of Porous Pavement.: Yes ☐ No ☒ Explanation: Porous pavement will not be used for pavement area.
Protect existing vegetation and sensitive areas: Yes ☐ No ☒ Explanation: Existing vegetation will be removed. There are no sensite areas on site.
Re-vegetate disturbed areas. Including planting and preservation of drought tolerant vegetation. : Yes ☒ No ☐ Explanation: All landscape areas to be planted with drought tolerant vegetation.

Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: Unnecessary compaction will be minimized.
Utilize naturalized/rock-lined drainage swales in place of underground piping or imperviously lined swales: Yes ☐ No ☐ Explanation: The drainage will be routed through the site by a concrete ribbon gutter that will allow drainage to flow into a curb inlet before making its way into the underground infiltration system.
Stake off areas that will be used for landscaping to minimize compaction during construction : Yes ☒ No ☐ Explanation: Yes
Use of Rain Barrels and Cisterns, Including the use of on-site water collection systems.: Yes ☐ No ☒ Explanation: Rain Barrels and Cisterns will not be used for the proposed project.
Stream Setbacks. Includes a specified distance from an adjacent steam: : Yes ☐ No ☒ Explanation: There is no exsiting stream going through the site.

It is noted that, in the Phase II Small MS4 Permit, site design elements for green roofs and vegetative swales are required. Due to the local climatology in the Mojave River Watershed, proactive measures are taken to maximize the amount of drought tolerant vegetation. It is not practical in this region to have green roofs or vegetative swales. As part of site design the project proponent should utilize locally recommended vegetation types for landscaping. Typical landscaping recommendations are found in following local references:

San Bernardino County Special Districts:

Guide to High Desert Landscaping -
http://www.specialdistricts.org/Modules/ShowDocument.aspx?documentid=795

Recommended High-Desert Plants -
http://www.specialdistricts.org/modules/showdocument.aspx?documentid=553

Mojave Water Agency:

Desert Ranch: http://www.mojavewater.org/files/desertranchgardenprototype.pdf

Summertree: http://www.mojavewater.org/files/Summertree-Native-Plant-Brochure.pdf

Thornless Garden: http://www.mojavewater.org/files/thornlessgardenprototype.pdf

Mediterranean Garden: http://www.mojavewater.org/files/mediterraneangardenprototype.pdf

Lush and Efficient Garden: http://www.mojavewater.org/files/lushandefficientgardenprototype.pdf

Alliance for Water Awareness and Conservation (AWAC) outdoor tips – http://hdawac.org/save-outdoors.html

4.2 Treatment BMPs

After implementation and design of both Source Control BMPs and Site Design BMP measures, any remaining runoff from impervious DMAs must be directed to one or more on-site, treatment BMPs (LID or biotreatment) designed to infiltrate, evaportranspire, and/or bioretain the amount of runoff specified in Permit Section E.12.e (ii)(c) Numeric Sizing Criteria for Storm Water Retention and Treatment.

4.2.1 Project Specific Hydrology Characterization

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in Section E.12.e.ii.c and Section E.12.f of the Phase II Small 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 from hydromodification.

If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.

It is noted that in the Phase II Small MS4 Permit jurisdictions, the LID BMP Design Capture Volume criteria is based on the 2-year rain event. The hydromodification performance criterion is based on the 10-year rain event.

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), San Bernardino County requires use of the P_6 method (Form 4.2-1) For pre- and post-development hydrologic calculation, San Bernardino County 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 hydromodification 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): 299625	2 Imperviousness after applying preventative site design practices (Imp%): 79	3 Runoff Coefficient (Rc): _0.59 *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 $P_{2yr-1hr}$ (in): 0.387 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.48 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (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): 1371 *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 Hydromodification Assessment (DA 1)

Is the change in post- and pre- condition flows captured on-site? : Yes ☒ No ☐

If "Yes", then complete Hydromodification assessment of site hydrology for 10yr 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- Addendum 1)*

If "No," then proceed to Section 4.3 BMP Selection and Sizing

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	1 2140 *Form 4.2-3 Item 12*	2 14 *Form 4.2-4 Item 13*	3 7.6 *Form 4.2-5 Item 10*
Post-developed	4 3038 *Form 4.2-3 Item 13*	5 8 *Form 4.2-4 Item 14*	6 8.2 *Form 4.2-5 Item 14*
Difference	7 *898* *Item 4 – Item 1*	8 *6* *Item 2 – Item 5*	9 *0.6* *Item 6 – Item 3*
Difference (as % of pre-developed)	10 *42%* *Item 7 / Item 1*	11 *43%* *Item 8 / Item 2*	12 *8%* *Item 9 / Item 3*

Form 4.2-3 Hydromodification 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	Barren							
2a Hydrologic Soil Group (HSG)	A							
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*	29625							
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	78							
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	Commerci .							
2b Hydrologic Soil Group (HSG)	A							
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*	29625							
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	84							

5 Pre-Developed area-weighted CN: 78	**7** Pre-developed soil storage capacity, S (in): 2.82 *S = (1000 / Item 5) - 10*	**9** Initial abstraction, I_a (in): 0.56 *I_a = 0.2 * Item 7*
6 Post-Developed area-weighted CN: 84	**8** Post-developed soil storage capacity, S (in): 1.18 *S = (1000 / Item 6) - 10*	**10** Initial abstraction, I_a (in): 0.37 *I_a = 0.2 * Item 8*

11 Precipitation for 10 yr, 24 hr storm (in): 2.62
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

12 Pre-developed Volume (ft^3): 2140
*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): 3038
*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 hydromodification requirement, (ft^3): 746
*Vhydro = (Item 13 * 0.95) – Item 12*

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume DA 2		
[1] Project area DA 1 (ft^2): 171857	[2] Imperviousness after applying preventative site design practices (Imp%): 87	[3] Runoff Coefficient (Rc): _69 *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 $P_{2yr-1hr}$ (in): 0.387 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
[5] Compute P_6, Mean 6-hr Precipitation (inches): 0.48 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (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): 9224 *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 Hydromodification Assessment DA 2

Is the change in post- and pre- condition flows captured on-site? : Yes ☒ No ☐

If "Yes", then complete Hydromodification assessment of site hydrology for 10yr 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- Addendum 1)*

If "No," then proceed to Section 4.3 BMP Selection and Sizing

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	[1] 12413 *Form 4.2-3 Item 12*	[2] 8 *Form 4.2-4 Item 13*	[3] 7.6 *Form 4.2-5 Item 10*
Post-developed	[4] 22665 *Form 4.2-3 Item 13*	[5] 9 *Form 4.2-4 Item 14*	[6] 8.3 *Form 4.2-5 Item 14*
Difference	[7] *10252* *Item 4 – Item 1*	[8] *5* *Item 2 – Item 5*	[9] *0.7* *Item 6 – Item 3*
Difference (as % of pre-developed)	[10] *83%* *Item 7 / Item 1*	[11] *36%* *Item 8 / Item 2*	[12] *9%* *Item 9 / Item 3*

Form 4.2-3 Hydromodification Assessment for Runoff Volume DA 2

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	Barren							
2a Hydrologic Soil Group (HSG)	A							
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*	171857							
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	78							
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	Commerci.							
2b Hydrologic Soil Group (HSG)	A							
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*	171857							
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	89							

5 Pre-Developed area-weighted CN: 78	**7** Pre-developed soil storage capacity, S (in): 2.82 *S = (1000 / Item 5) - 10*	**9** Initial abstraction, I_a (in): 0.56 *I_a = 0.2 * Item 7*
6 Post-Developed area-weighted CN: 89	**8** Post-developed soil storage capacity, S (in): 1.20 *S = (1000 / Item 6) - 10*	**10** Initial abstraction, I_a (in): 0.24 *I_a = 0.2 * Item 8*

11 Precipitation for 10 yr, 24 hr storm (in): 2.62
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

12 Pre-developed Volume (ft^3): 12413
*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): 22665
*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 hydromodification requirement, (ft^3): 9118
*Vhydro = (Item 13 * 0.95) – Item 12*

Form 4.2-4 Hydromodification 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*	Refer to AES output							
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 hydromodification requirement (min): *$T_{C\text{-}Hydro}$ = (Item 13 * 0.95) – Item 14*

Form 4.2-5 Hydromodification 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 - 0.7 LOG Form 4.2-4 Item 5 /60)*		Refer to AES output					
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 Hydromodification Requirement (cfs):	$Q_{p\text{-}hydro}$ = *(Item 14 * 0.95) – Item 10*

4.3 BMP Selection and Sizing

Complete the following forms for each project site DA to document that the proposed treatment (LID/Bioretention) BMPs conform to the project DCV developed to meet performance criteria specified in the Phase II Small 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 Phase II Small MS4 Permit (see Section 5.3 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design Measures (Form 4.3-2)
- Retention and Infiltration BMPs (Form 4.3-3) or
- Biotreatment BMPs (Form 4.3-4).

> Please note that the selected BMPs may also be used as dual purpose for on-site, hydromodification mitigation and management.

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 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 Form 4.3-2 to determine the feasibility of applicable Site Design 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 Site Design 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 site design, retention and/or infiltration BMPs is unable to mitigate the entire DCV, then the remainder of the volume-based performance criteria that cannot be achieved with site design, retention and/or infiltration BMPs must be managed through biotreatment BMPs. If biotreatment BMPs are used, then they must be sized to provide equivalent effectiveness based on Template Section 4.3.4.

4.3.1 Exceptions to Requirements for Bioretention Facilities

Contingent on a demonstration that use of bioretention or a facility of equivalent effectiveness is infeasible, other types of biotreatment or media filters (such as tree-box-type biofilters or in-vault media filters) may be used for the following categories of Regulated Projects:

1) Projects creating or replacing an acre or less of impervious area, and located in a designated pedestrian-oriented commercial district (i.e., smart growth projects), and having at least 85% of the entire project site covered by permanent structures;

2) Facilities receiving runoff solely from existing (pre-project) impervious areas; and

3) Historic sites, structures or landscapes that cannot alter their original configuration in order to maintain their historic integrity.

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 ten 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, Selection and Evaluation of Biotreatment 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, Site Design 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, Site Design BMPs.*

4.3.2 Site Design BMP

Section E.12.e. of the Small Phase II MS4 Permit emphasizes the use of LID preventative measures; and the use of Site Design Measures reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable Site Design Measures 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 Site Design BMPs. If a project cannot feasibly meet BMP sizing requirements or cannot fully address hydromodification, feasibility of all applicable Site Design BMPs 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 BMP. Refer to Section 5.4 in the TGD for more detailed guidance.

Form 4.3-2 Site Design 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 Stormtrap underground infiltration	DA 2 DMA B BMP Type Stormtrap underground infitlration	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Total impervious area draining to pervious area (ft^2)			
3 Ratio of pervious area receiving runoff to impervious area			
4 Retention volume achieved from impervious area dispersion (ft^3) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff*			
5 Sum of retention volume achieved from impervious area dispersion (ft^3): *$V_{retention}$ =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 (ft^2)			
8 Ponding depth (ft) (min. 0.5 ft.)			
9 Surface area of amended soil/gravel (ft^2)			
10 Average depth of amended soil/gravel (ft) (min. 1 ft.)			
11 Average porosity of amended soil/gravel			
12 Retention volume achieved from on-lot infiltration (ft^3) *$V_{retention}$ = (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)*			
13 Runoff volume retention from on-lot infiltration (ft^3): *$V_{retention}$ =Sum of Item 12 for all BMPs*			

Form 4.3-2 cont. Site Design BMPs (DA 1)

14 Implementation of Street Trees: Yes ☐ No ☒ *If yes, complete Items 14-18. If no, proceed to Item 19*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
15 Number of Street Trees			
16 Average canopy cover over impervious area (ft^2)			
17 Runoff volume retention from street trees (ft^3) *$V_{retention}$ = Item 15 * Item 16 * (0.05/12) assume runoff retention of 0.05 inches*			
18 Runoff volume retention from street tree BMPs (ft^3): *$V_{retention}$ = Sum of Item 17 for all BMPs*			
19 Total Retention Volume from Site Design BMPs: *Sum of Items 5, 13 and 18*			

4.3.3 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 C 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 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).

4.3.3.1 Allowed Variations for Special Site Conditions

The bioretention system design parameters of this Section may be adjusted for the following special site conditions:

1) Facilities located within 10 feet of structures or other potential geotechnical hazards established by the geotechnical expert for the project may incorporate an impervious cutoff wall between the bioretention facility and the structure or other geotechnical hazard.

2) Facilities with documented high concentrations of pollutants in underlying soil or groundwater, facilities located where infiltration could contribute to a geotechnical hazard, and facilities located on elevated plazas or other structures may incorporate an impervious liner and may locate the underdrain discharge at the bottom of the subsurface drainage/storage layer (this configuration is commonly known as a “flow-through planter”).

3) Facilities located in areas of high groundwater, highly infiltrative soils or where connection of underdrain to a surface drain or to a subsurface storm drain are infeasible, may omit the underdrain.

4) Facilities serving high-risk areas such as fueling stations, truck stops, auto repairs, and heavy industrial sites may be required to provide adequate pretreatment to address pollutants of concern unless these high-risk areas are isolated from storm water runoff or bioretention areas with no chance of spill migration.

.

Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)

1 Remaining LID DCV not met by site design BMP (ft^3): 1371 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item19*

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 BMP#3- Infiltration Basin	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix C of the TGD for WQMP for minimum requirements for assessment methods*	40		
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	3		
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	13		
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48		
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	n/a		
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	1		
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*	458		
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		
10 Amended soil porosity	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		
12 Gravel porosity	n/a		
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	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))]*	25305		
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	0		

16 Total Retention Volume from LID Infiltration BMPs: 25305 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*

17 Fraction of DCV achieved with infiltration BMP: >100% *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.

Form 4.3-3 Infiltration LID BMP - including underground BMPs DA 2

1 Remaining LID DCV not met by site design BMP (ft^3): 55321 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item19*

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 2 DMA B BMP Type BMP #2 - Infiltration Basin	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix C of the TGD for WQMP for minimum requirements for assessment methods*	40		
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	3		
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	13		
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48		
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	n/a		
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	0.5		
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*	402		
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		
10 Amended soil porosity	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		
12 Gravel porosity	n/a		
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	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))]*	22211		
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	33377		

16 Total Retention Volume from LID Infiltration BMPs: 55588 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*

17 Fraction of DCV achieved with infiltration BMP: >100% *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.

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration. 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 4.3-4 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV. Biotreatment computations are included as follows:

- Use Form 4.3-5 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-6 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-7 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-4 Selection and Evaluation of Biotreatment BMP (DA 1)

1 Remaining LID DCV not met by site design , or infiltration, BMP for potential biotreatment (ft^3): *Form 4.2-1 Item 7 - Form 4.3-2 Item 19 – Form 4.3-3 Item 16*	List pollutants of concern *Copy from Form 2.3-1.*	
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 4.3-5 and 4.3-6 to compute treated volume* ☐ Bioretention with underdrain ☐ Planter box with underdrain ☐ Constructed wetlands ☐ Wet extended detention ☐ Dry extended detention	Flow-based biotreatment *Use Form 4.3-7 to compute treated flow* ☐ Vegetated swale ☐ Vegetated filter strip ☐ Proprietary biotreatment
3 Volume biotreated in volume based biotreatment BMP (ft^3): *Form 4.3-5 Item 15 + Form 4.3-6 Item 13*	4 Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft^3): *Item 1 – Item 3*	5 Remaining fraction of LID DCV for sizing flow based biotreatment BMP: % *Item 4 / Item 1*
6 Flow-based biotreatment BMP capacity provided (cfs): *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 4.3-5 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 4.3-6 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 : *(Sum of Item 12 for all BMP included in plan)*				

Form 4.3-7 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 $2^{1.67}$ * Item $3^{0.5}$)			
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^{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 4.3-8 to demonstrate how on-site LID DCV is met with proposed site design, infiltration, 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 4.3-8 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)
1 Total LID DCV for the Project DA-1 (ft^3): 1371 *Copy Item 7 in Form 4.2-1*
2 On-site retention with site design BMP (ft^3): *Copy Item18 in Form 4.3-2*
3 On-site retention with LID infiltration BMP (ft^3): 25305 *Copy Item 16 in Form 4.3-3*
4 On-site biotreatment with volume based biotreatment BMP (ft^3): *Copy Item 3 in Form 4.3-4*
5 Flow capacity provided by flow based biotreatment BMP (cfs): *Copy Item 6 in Form 4.3-4*
6 LID BMP performance criteria are achieved if answer to any of the following is “Yes”: • Full retention of LID DCV with site design or infiltration 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; therefore biotreatment BMP provides 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*
7 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 Site Design, retention and infiltration, , and biotreatment BMPs provide less than full LID DCV capture: ☐ *Checked yes if Form 4.3-4 Item 7is checked yes, Form 4.3-4 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)%* • Facilities, or a combination of facilities, of a different design than in Section E.12.e.(ii)(f) may be permitted if all of the following Phase II Small MS4 General Permit 2013-0001-DWQ 55 February 5, 2013 measures of equivalent effectiveness are demonstrated: 1) Equal or greater amount of runoff infiltrated or evapotranspired; ☐ 2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment; ☐ 3) Equal or greater protection against shock loadings and spills; ☐ 4) Equal or greater accessibility and ease of inspection and maintenance. ☐

4.3.6 Hydromodification Control BMP

Use Form 4.3-9 to compute the remaining runoff volume retention, after Site Design BMPs are implemented, needed to address hydromodification, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential hydromodification. Describe the proposed hydromodification treatment control BMP. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

<table>
<tr><th colspan="2">Form 4.3-9 Hydromodification Control BMPs (DA 1)</th></tr>
<tr><td>1 Volume reduction needed for hydromodification performance criteria (ft³): 746
(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1</td><td>2 On-site retention with site design and infiltration, BMP (ft³): 25305 Sum of Form 4.3-8 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 hydromodification volume reduction</td></tr>
<tr><td>3 Remaining volume for hydromodification volume capture (ft³): 0 Item 1 – Item 2</td><td>4 Volume capture provided by incorporating additional on-site BMPs (ft³): n/a</td></tr>
<tr><td colspan="2">5 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☒
If yes, hydromodification 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 BMP ☒
• 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 ☐</td></tr>
<tr><td colspan="2">6 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☒
If yes, hydromodification 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 retention BMPs ☒</td></tr>
</table>

4.3.6 Hydromodification Control BMP

Use Form 4.3-9 to compute the remaining runoff volume retention, after Site Design BMPs are implemented, needed to address hydromodification, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential hydromodification. Describe the proposed hydromodification treatment control BMP. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-9 Hydromodification Control BMPs DA 2	
1 Volume reduction needed for hydromodification performance criteria (ft³): 9118 *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	2 On-site retention with site design and infiltration, BMP (ft³): 55588 *Sum of Form 4.3-8 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 hydromodification volume reduction*
3 Remaining volume for hydromodification volume capture (ft³): 0 *Item 1 – Item 2*	4 Volume capture provided by incorporating additional on-site BMPs (ft³): n/a
5 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☒ *If yes, hydromodification 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 BMP ☒ • 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 ☐	
6 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☒ *If yes, hydromodification 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 retention BMPs ☒	

4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, 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 Designs — Facilities, or a combination of facilities, of a different design than in Permit Section E.12.e.(ii)(f) may be permitted if all of the following measures of equivalent effectiveness are demonstrated:

1) Equal or greater amount of runoff infiltrated or evapotranspired;

2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment;

3) Equal or greater protection against shock loadings and spills;

4) Equal or greater accessibility and ease of inspection and maintenance.

The Project Proponent will need to obtain written approval for an alternative design from the Lahontan Regional Water Board Executive Officer (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMPs 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 a Maintenance Agreement. The Maintenance Agreement must also be attached to the WQMP.

Note that at time of Project construction completion, the Maintenance Agreement must be completed, signed, notarized and submitted to the County Stormwater Department

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 Basin (BMP#2 and 3)	Owner	Inspect and remove accumulated sediment at least twice per year. Inspect and maintain vegetation on a regular basis.	Bi-annual
ADS StormTech MC4500 Infiltration System (BMP#1)	Owner	Inspect and remove accumulated sediment and debris from isolator row at least twice per year.	Bi-annual

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 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.

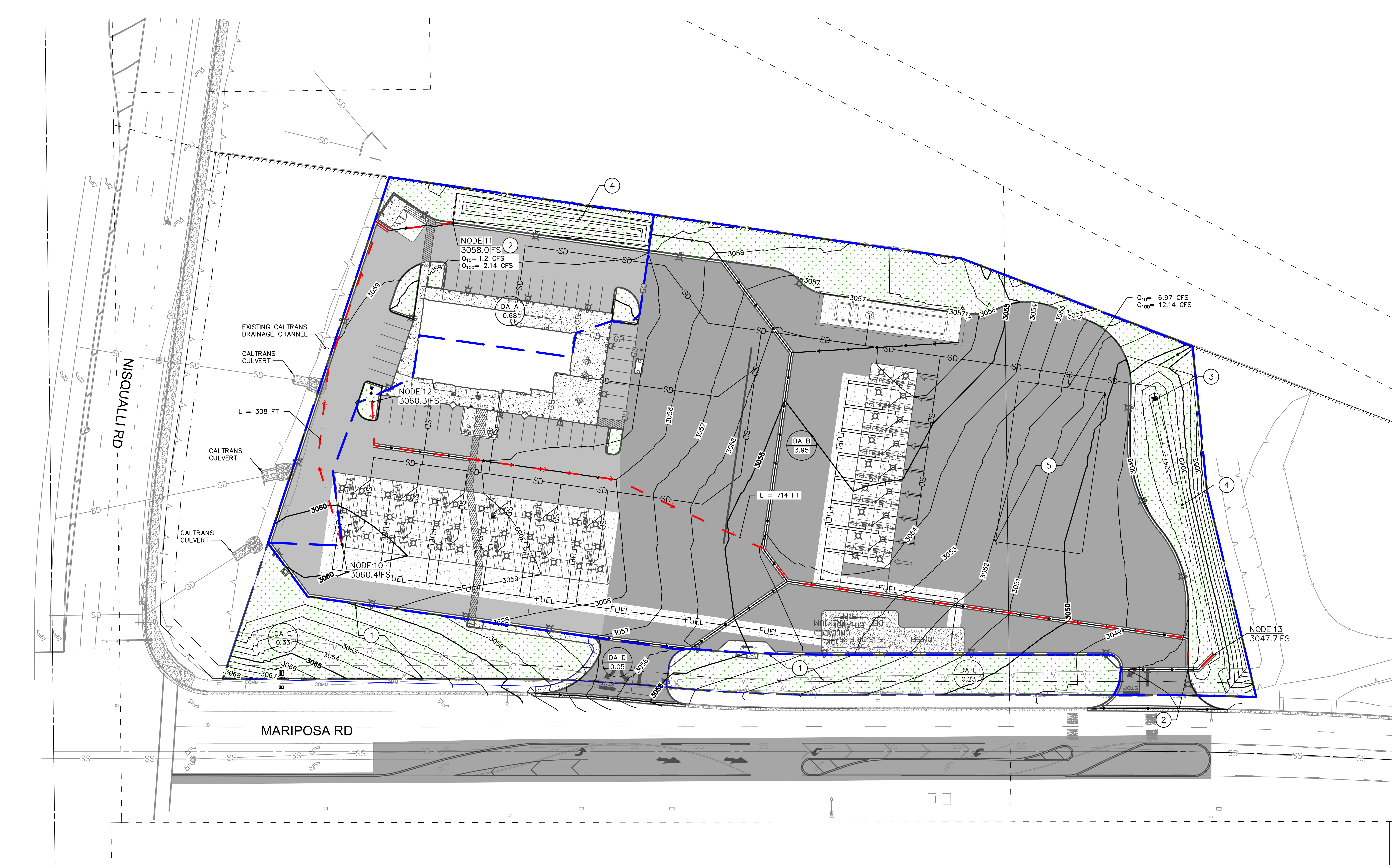
6.3 Post Construction

Attach all O&M Plans and Maintenance Agreements for BMP to the WQMP.

6.4 Other Supporting Documentation

- BMP Educational Materials
- Activity Restriction – C,C&R's & Lease Agreements

Appendix A: Site Plan



SITE DATA

PARCEL SIZE:	227,891± S.F. (5.23± AC)
LIMITS OF DISTURBANCE:	227,891± S.F. (5.23± AC)
PROPOSED IMPERVIOUS AREA:	174,662± S.F. (INCLUDING BLDG)
PROPOSED PERVIOUS AREA:	53,229± S.F.
PROPOSED BLDG AREA:	6,112± S.F.
APN:	3092-311-09 AND 3092-311-10
ZONING:	COMMERCIAL
ADDRESS:	NWC OF NISQUALLI ROAD AND MARIPOSA ROAD, VICTORVILLE
RECEIVING WATERS:	MOJAVE RIVER WATERSHED (RECEIVING WATER IS BELOW THE NARROWS)

STRUCTURAL BMP NOTES

1. SELF MITIGATING PERVIOUS AREA.
2. PROPOSED CURB CUT.
3. PROPOSED OVERFLOW DRAIN.
4. PROPOSED INFILTRATION BASIN.
5. PROPOSED ADS STORMTECH MC-4500 INFILTRATION SYSTEM.

SITE DATA

TOTAL SITE AREA (ACRES)	5.23
BUILDING AREA (ACRES)	0.14
LANDSCAPE AREA (ACRES)	1.22

IMPERVIOUS AREA (%)	76
PERVIOUS AREA (%)	24

HYDROLOGY DATA

SUB-AREA	DA A	DA B	DA C	DA D	DA E
AREA (ACRES)	0.68	3.95	0.33	0.05	0.23
TIME OF CONCENTRATION PATH LENGTH (FEET)	308	714	SELF-TREATING AREA	SELF-TREATING AREA	SELF-TREATING AREA
10-YEAR, 24-HOUR FLOW CFS	1.2	6.97	SELF-TREATING	DE MINMUS	SELF-TREATING
100-YEAR, 24-HOUR FLOW CFS	2.14	12.14	SELF-TREATING	DE MINMUS	SELF-TREATING

LEGEND

- BOUNDARY LINE
- CENTERLINE
- DRAINAGE AREA (DA)
- FLOW LINE
- XX EXISTING CONTOUR
- 2.00% PROPOSED FLOW
- DA # / X AC — DA NAME DRAINAGE AREA

NORTH

DRAINAGE NOTES

- THE PROPOSED SITE HAS ZERO DISCHARGE. ALL DRAINAGE IS CAPTURED AND TREATED ONSITE.
- REFER TO PROJECT CONSTRUCTION DOCUMENTS FOR PROPOSED STORM DRAIN INVERT AND SIZES.

GRAPHIC SCALE IN FEET
0 20 40 80
1"=40'
WHEN PRINTED AT FULL SIZE (24" BY 36")

SOURCE CONTROL BMPS

BMP ID	BMP DESCRIPTION
SC-74	ON-SITE STORM DRAIN INLETS
SC-41	PLAZA, SIDEWALKS, PARKING LOTS
SC-34	REFUSE / TRASH COLLECTION AREAS
SC-10	MISCELLANEOUS DRAIN OR WASH DOWN AREAS

SITE DESIGN BMPS

BMP ID	BMP DESCRIPTION
SD-10, SD-12	LANDSCAPE / OUTDOOR PESTICIDE USE
SD-11	ROOF RUNOFF
SD-13	STORM DRAIN STENCILING AND SIGNAGE → ALL SD GRATED INLETS, CURB CUTS (TYP.)
SD-32	REFUSE / TRASH COLLECTION AREAS

PERMANENT BMP ID #	BMP PROVIDED	SURFACE AREA	DCV (SEE WQMP REPORT FORM 4.2-1)	100-YEAR, 24-HOUR VOLUME	100-YEAR DRAWDOWN
BMP 1	ADS STORMTECH MC-4500 INFILTRATION SYSTEM	7,766 S.F.	9,224 FT^3	55,321 FT^3	15 HOURS
BMP 2	INFILTRATION BASIN	402 S.F.			48 HOURS
BMP 3	INFILTRATION BASIN	438 S.F.	1371 FT^3	8,712 FT^3	15 HOURS

BLDG Number	GP Number	Project Number

Kimley»Horn
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PHONE: 951-543-9868

Seal
1/13/2021

MAVERIK
STORE #:TBD
MARIPOSA ROAD & NASQUALLI ROAD
VICTORVILLE, CA

MAVERIK
185 SOUTH STATE STREET, SUITE 800
SALT LAKE CITY, UT. 84111

REVISION

No.	DESCRIPTION	DATE	APPROVED

CITY OF VICTORVILLE CALIFORNIA

CITY CASE NO.
CITY OF VICTORVILLE ENGINEERING DEPARTMENT
14343 Civic Drive, Victorville, CA 92392 (760) 955-5000
Approved By:
Brian W. Gengler, RCE C44730
City Engineer
DATE

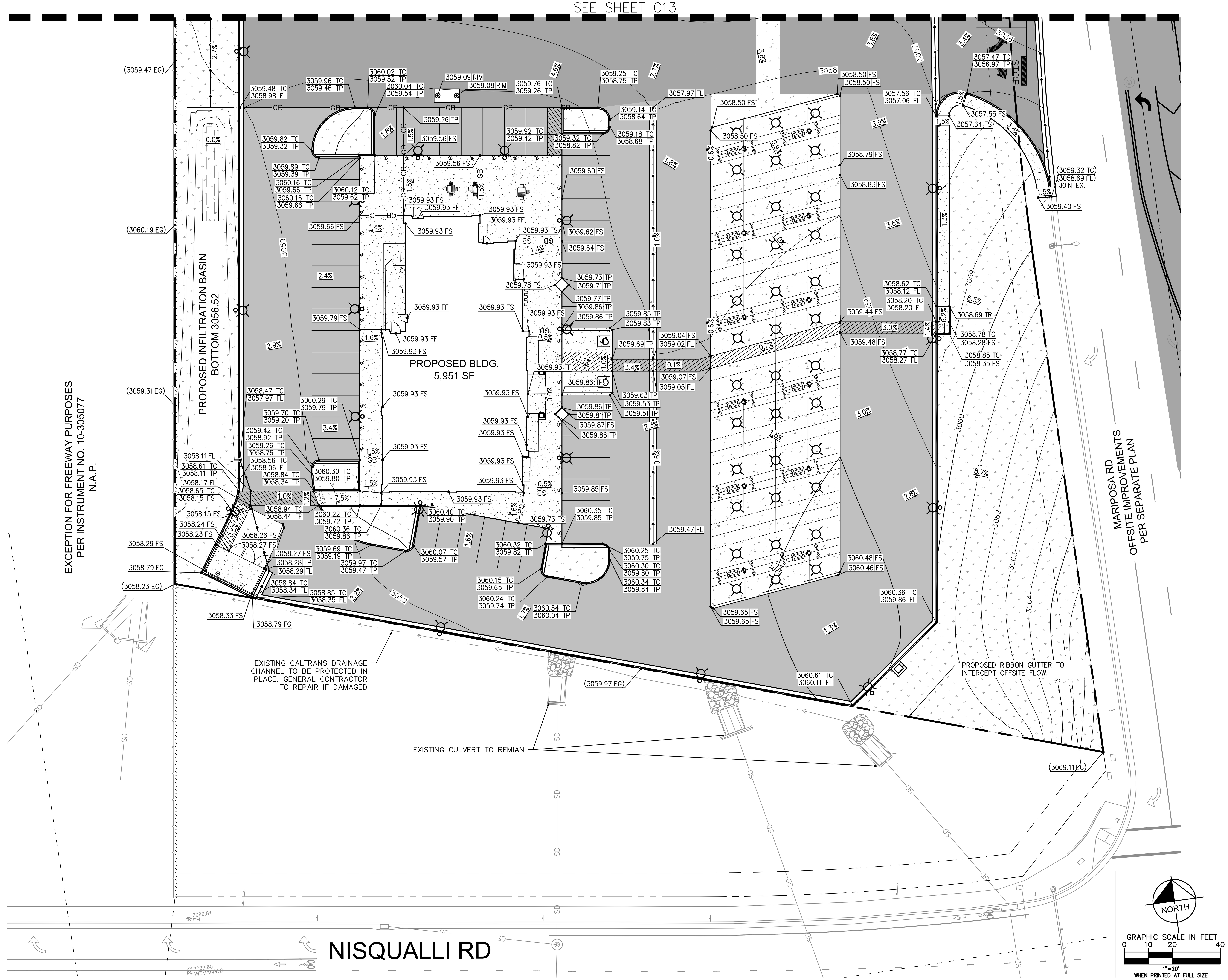
Sheet Name
HYDROLOGY EXHIBIT

Sheet Number
1 OF 1

1ST SUBMITTAL 12/18/2020

\\RIVFP01\CA_RIV\RIV_LDEV\MAVERIK\195274001 - VICTORVILLE NISQUALLI\REPORTS\HYDROLOGY\EXHIBITS\2020.12.15_PROPOSED HYDROLOGY EXHIBIT.DWG 1/13/2021 9:19 PM ASTORGA, LUPITA

Appendix B: Construction Documents



LEGEND

	PROPERTY LINE
	CENTER LINE
	SETBACKS
—GB—GB—GB—GB—	GRADE BREAK
129.50 TC / 129.00 TP	PROPOSED SPOT ELEVATION
(129.25 TC) / (128.75 TP)	EXISTING SPOT ELEVATION
2.00%	PROPOSED FLOW (DIRECTION AND SLOPE)
	STANDARD DUTY CONCRETE PAVEMENT
	HEAVY DUTY CONCRETE PAVEMENT
	HEAVY DUTY ASPHALT PAVEMENT
	STANDARD DUTY ASPHALT PAVEMENT
	LANDSCAPE/PLANTER AREA
	DETECTABLE WARNINGS

ESIMATED EARTHWORK QUANTITIES

CUT:	9,894 CY
FILL:	2,141 CY
NET:	7,753 CY CUT

NOTE: THE ABOVE QUANTITIES ARE APPROXIMATE IN PLACE VOLUMES CALCULATED FROM THE EXISTING GROUND TO THE PROPOSED FINISHED GRADE. EXISTING GROUND IS DEFINED BY THE CONTOURS AND SPOT GRADES ON THE BASE SURVEY. PROPOSED FINISHED GRADE IS DEFINED AS THE FINAL GRADE AS INDICATED ON THE GRADING PLAN(S).

THE EARTHWORK QUANTITIES ABOVE ARE FOR PERMIT PURPOSES ONLY. THEY HAVE NOT BEEN FACTORED TO ACCOUNT FOR CHANGES IN VOLUME DUE TO BULKING, CLEARING AND GRUBBING, SHRINKAGE, OVER- EXCAVATION AND RE-COMPACTION, AND CONSTRUCTION METHODS. NOR DO THEY ACCOUNT FOR THE THICKNESS OF PAVEMENT SECTIONS, FOOTINGS, SLABS, REUSE OF PULVERIZED MATERIALS THAT WILL UNDERLIE NEW PAVEMENTS, ETC. THE CONTRACTOR SHALL RELY ON THEIR OWN EARTHWORK ESTIMATES FOR BIDDING PURPOSES.

BLDG Number	GP Number	Project Number

Kimley»Horn

3880 LEMON STREET, STE. 420, RIVERSIDE, CA 92501
PHONE: 951-543-9868

Seal
1/14/2021

MAVERIK
STORE #:TBD
MARIPOSA ROAD & NASQUALLI ROAD
VICTORVILLE, CA

MAVERIK
185 SOUTH STATE STREET, SUITE 800
SALT LAKE CITY, UT, 84111

REVISION

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CITY OF VICTORVILLE
ENGINEERING DEPARTMENT
14343 Civic Drive, Victorville, CA 92392 (760) 955-5000

Approved By:
Brian W. Gengler, RCE C44730
City Engineer
DATE

Sheet Name	Sheet Number
GRADING PLAN	C12

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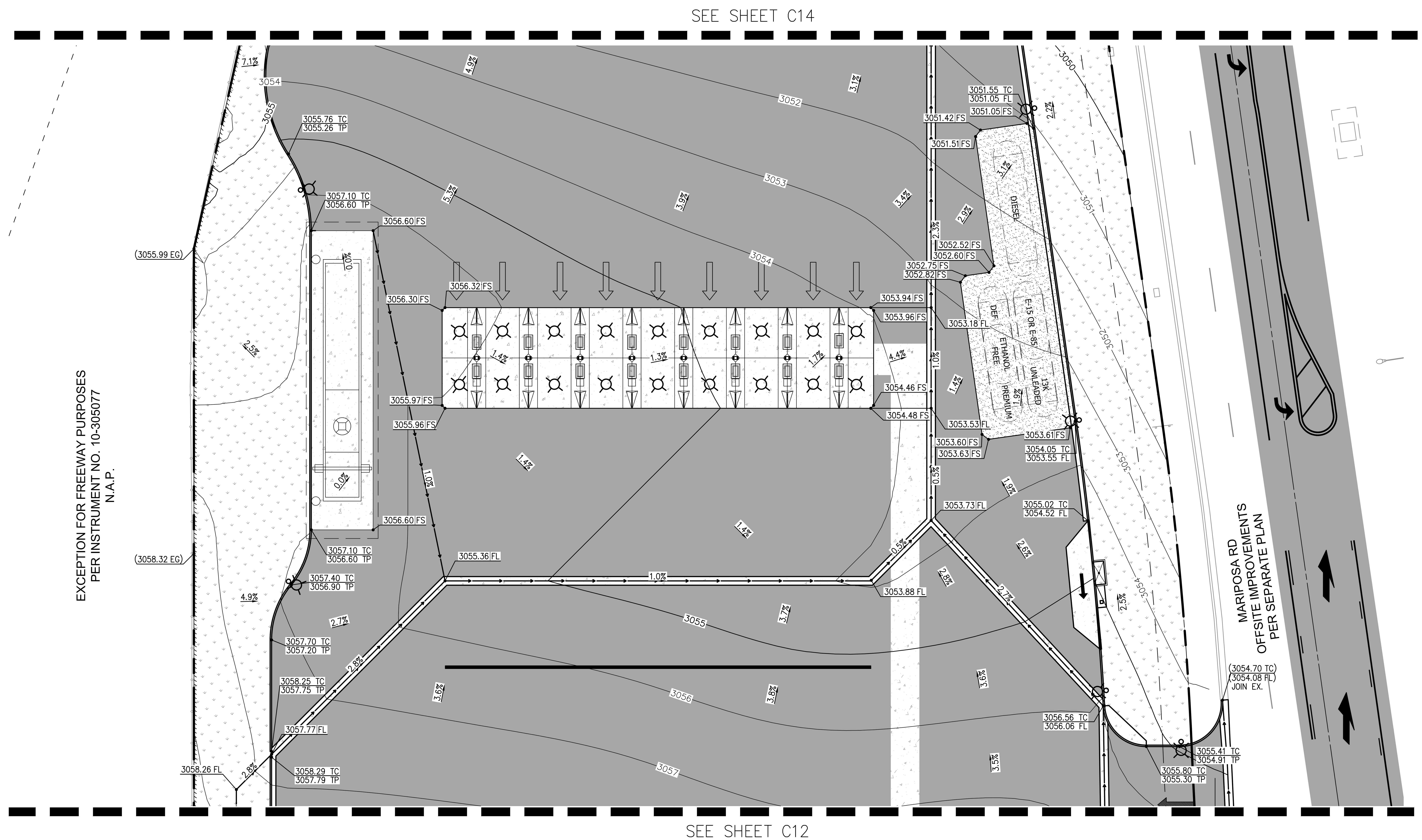
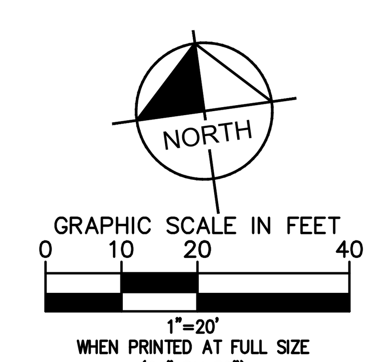


LEGEND

- PROPERTY LINE
- CENTER LINE
- SETBACKS
- GB GRADE BREAK
- 129.50 TC / 129.00 TP — PROPOSED SPOT ELEVATION
- (129.25 TC) / (128.75 TP) — EXISTING SPOT ELEVATION
- 2.00% — PROPOSED FLOW (DIRECTION AND SLOPE)
- STANDARD DUTY CONCRETE PAVEMENT
- HEAVY DUTY CONCRETE PAVEMENT
- HEAVY DUTY ASPHALT PAVEMENT
- STANDARD DUTY ASPHALT PAVEMENT
- LANDSCAPE/PLANTER AREA
- DETECTABLE WARNINGS



BLDG Number	GP Number	Project Number

Kimley»Horn

3880 LEMON STREET, STE. 420, RIVERSIDE, CA 92501
PHONE: 951-543-9868

REGISTERED PROFESSIONAL ENGINEER
SEAN MICHAEL ANTI
RCE NO. 78274
CIVIL
STATE OF CALIFORNIA
Seal
1/14/2021

MAVERIK
STORE #:TBD
MARIPOSA ROAD & NASQUALLI ROAD
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ENGINEERING DEPARTMENT
14343 Civic Drive, Victorville, CA 92392 (760) 955-5000

Approved By:

Brian W. Gengler, RCE C44730
City Engineer

DATE

Sheet Name	Sheet Number
GRADING PLAN CONTINUATION	C13

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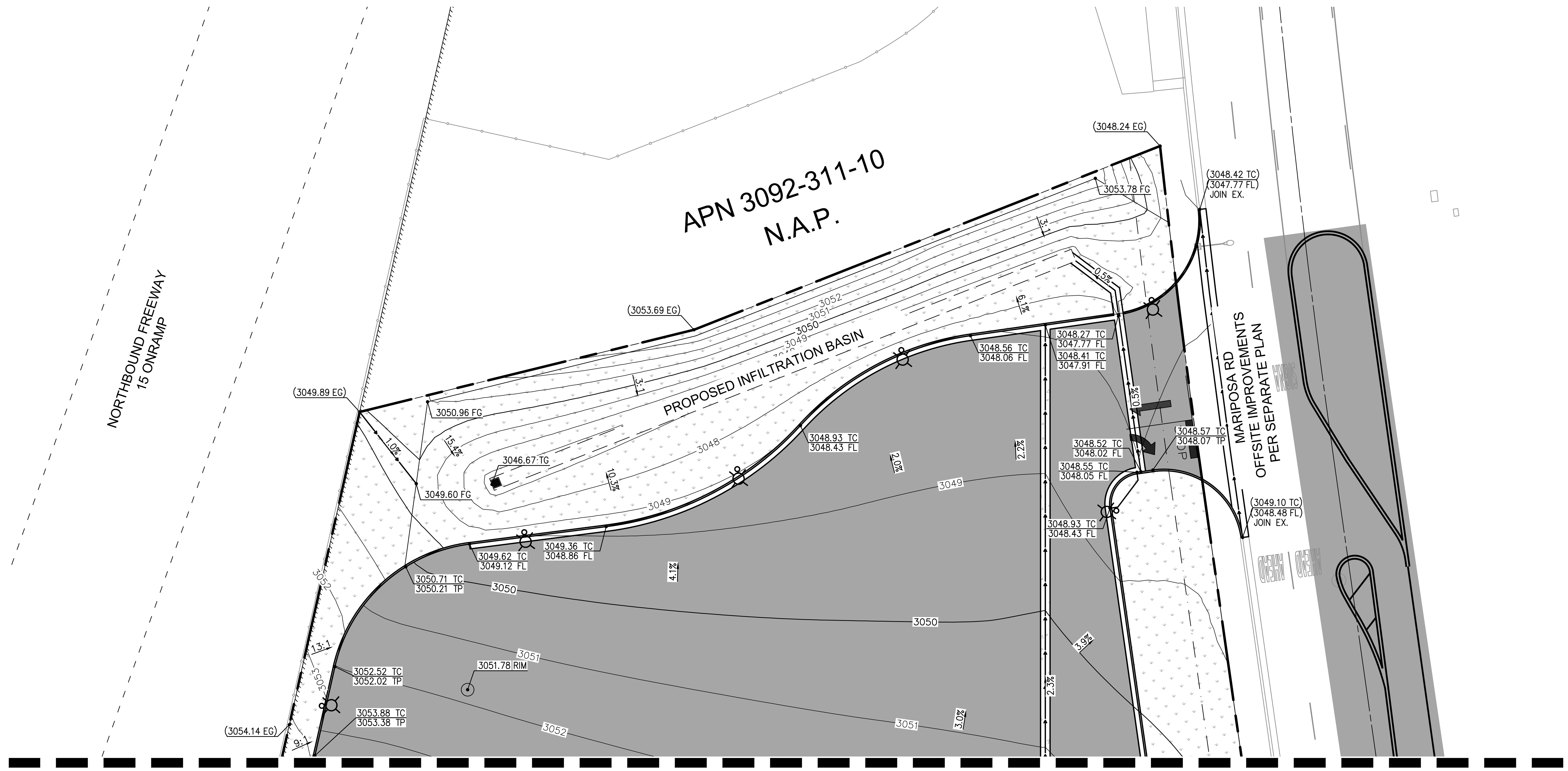

SEE SHEET C13

LEGEND

PROPERTY LINE
CENTER LINE
SETBACKS
GRADE BREAK
PROPOSED SPOT ELEVATION (129.50 TC / 129.00 TP)
EXISTING SPOT ELEVATION ((129.25 TC) / (128.75 TP))
PROPOSED FLOW (DIRECTION AND SLOPE) (2.00%)
STANDARD DUTY CONCRETE PAVEMENT
HEAVY DUTY CONCRETE PAVEMENT
HEAVY DUTY ASPHALT PAVEMENT
STANDARD DUTY ASPHALT PAVEMENT
LANDSCAPE/PLANTER AREA
DETECTABLE WARNINGS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
1"=20'
WHEN PRINTED AT FULL SIZE (24" BY 36")

BLDG Number	GP Number	Project Number

Kimley»Horn

3880 LEMON STREET, STE. 420, RIVERSIDE, CA 92501
PHONE: 951-543-9868

Seal 1/14/2021

MAVERIK
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CITY OF VICTORVILLE
ENGINEERING DEPARTMENT
14343 Civic Drive, Victorville, CA 92392 (760) 955-5000
Approved By:
Brian W. Gengler, RCE C44730
City Engineer
DATE

Sheet Name: GRADING PLAN CONTINUATION
Sheet Number: C14

Appendix C: BMP Details

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

ADVANCED DRAINAGE SYSTEMS, INC.

FOR STORMTECH INSTRUCTIONS, DOWNLOAD THE INSTALLATION APP

MAVERICK VICTORVILLE

VICTORVILLE, CA

MC-4500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-4500.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/IN/IN. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-4500 CHAMBER SYSTEM

1. STORMTECH MC-4500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS SO AS NOT TO DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 12" (300 mm) BETWEEN ADJACENT CHAMBER ROWS.
10. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
11. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIAL BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
12. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-4500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

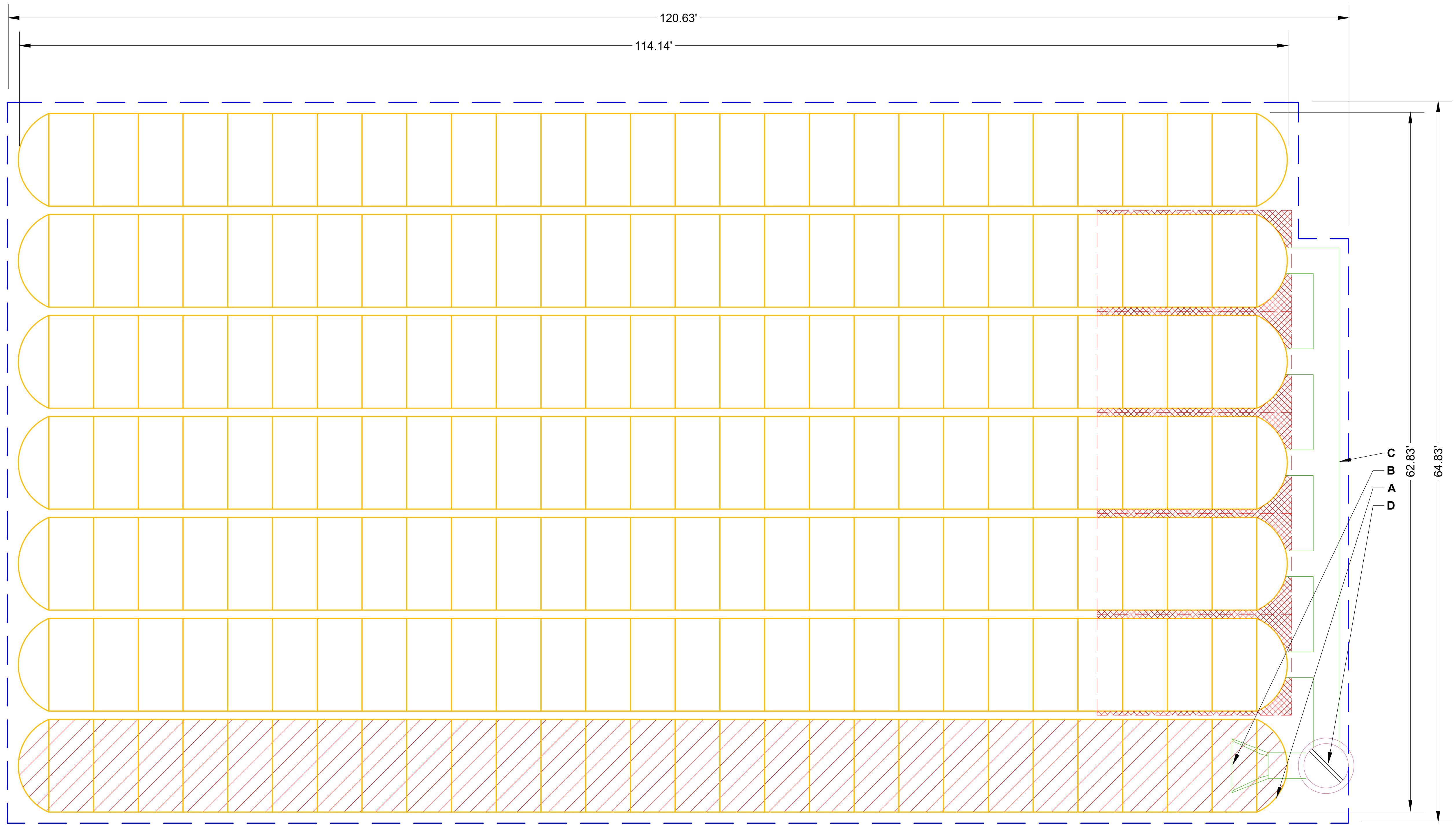
CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT	
189	STORMTECH MC-4500 CHAMBERS
14	STORMTECH MC-4500 END CAPS
12	STONE ABOVE (in)
9	STONE BELOW (in)
40	STONE VOID
33377	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)
7766	SYSTEM AREA (SF)
370.9	SYSTEM PERIMETER (ft)

CONCEPTUAL ELEVATIONS	
MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	12.75
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	8.25
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	7.75
MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	7.75
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	7.75
TOP OF STONE:	6.75
TOP OF MC-4500 CHAMBER:	5.75
24" x 24" BOTTOM MANIFOLD INVERT:	0.94
24" ISOLATOR ROW PLUS INVERT:	0.94
BOTTOM OF MC-4500 CHAMBER:	0.75
BOTTOM OF STONE:	0.00

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	24" BOTTOM PARTIAL CUT END CAP, PART#: MC4500IEPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26"	
FLAMP	B	INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MC450024RAMP		
MANIFOLD	C	24" x 24" BOTTOM MANIFOLD, ADS N-12	2.26"	
CONCRETE STRUCTURE W/WEIR	D	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		41.5 CFS IN



ISOLATOR ROW PLUS (SEE DETAIL)

PLACE MINIMUM 17.50' OF ADSPLUS175 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

MAVERICK VICTORVILLE
VICTORVILLE, CA

DRAWN: GC
CHECKED: N/A
DATE:
PROJECT #:

REV	DRW	CHK	DESCRIPTION

StormTech
Detention • Retention • Water Quality
520 CROMWELL AVENUE | ROCKY HILL | CT | 06067
860-529-8188 | 888-892-2694 | WWW.STORMTECH.COM

ADS
ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

0 10' 20'

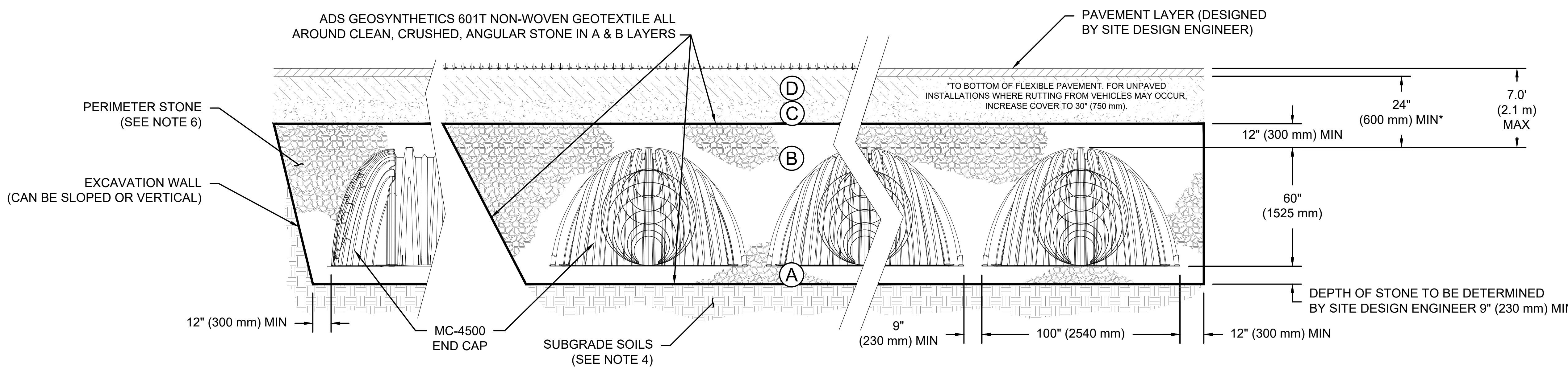
SHEET
2 OF 5

ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:

1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-4500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/IN/IN. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

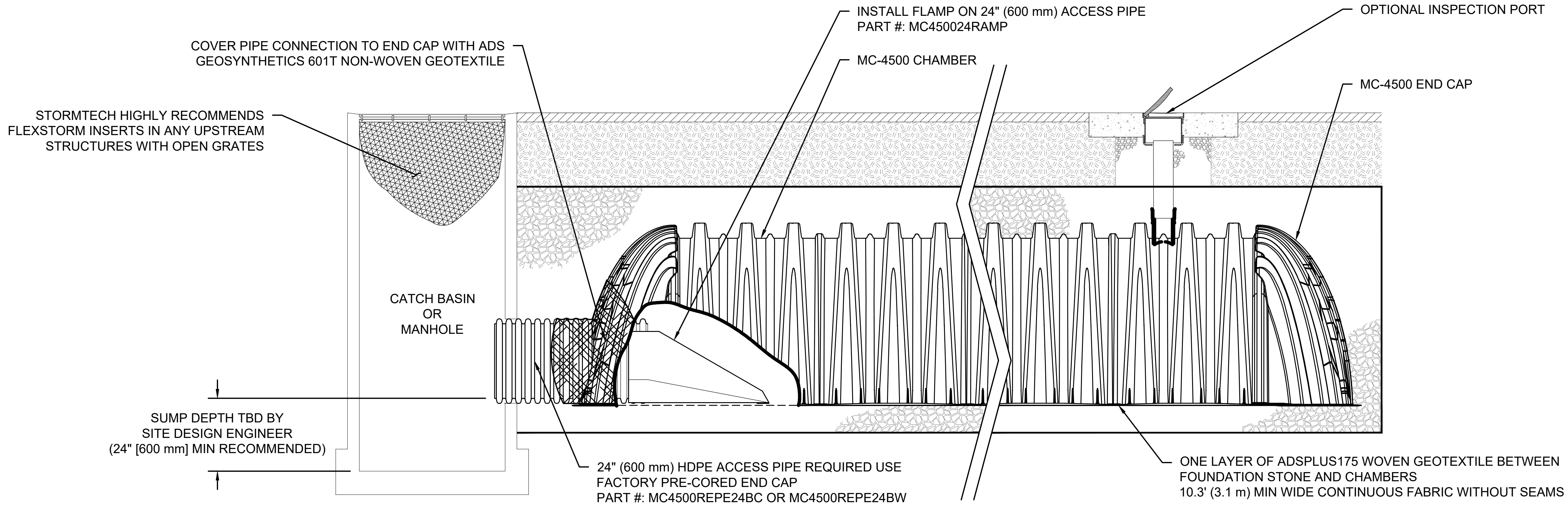
MAVERICK VICTORVILLE
VICTORVILLE, CA

DRAWN: GC
CHECKED: N/A
DATE:
PROJECT #:

REV	DRW	CHK	DESCRIPTION

StormTech
Detention • Retention • Water Quality
520 CROMWELL AVENUE | ROCKY HILL | CT | 06067
860-529-8188 | 888-892-2694 | WWW.STORMTECH.COM

ADS
ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473



MC-4500 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.

2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

MAVERICK VICTORVILLE
VICTORVILLE, CA

DATE:
DRAWN: GC
PROJECT #:
CHECKED: N/A

REV	DRW	CHK	DESCRIPTION

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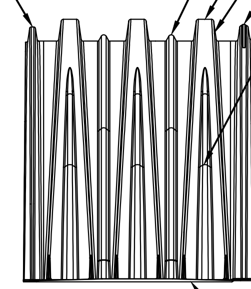
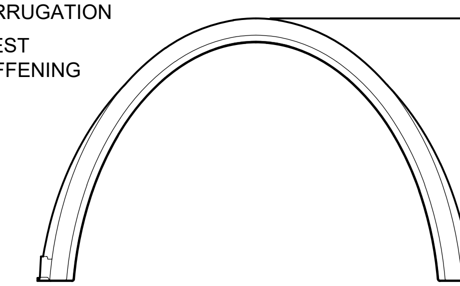
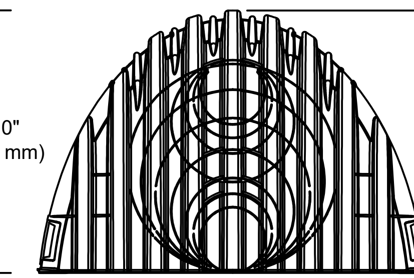
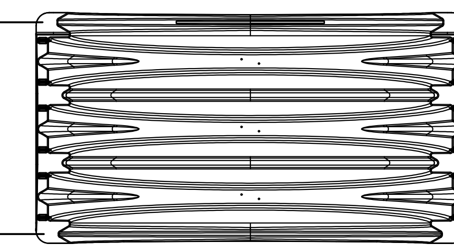
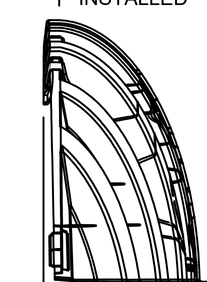
MC-4500 TECHNICAL SPECIFICATION
NTS











NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 mm X 1524 mm X 1227 mm)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m³)
MINIMUM INSTALLED STORAGE*	162.6 CUBIC FEET	(4.60 m³)
WEIGHT (NOMINAL)	125.0 lbs.	(56.7 kg)

NOMINAL END CAP SPECIFICATIONS

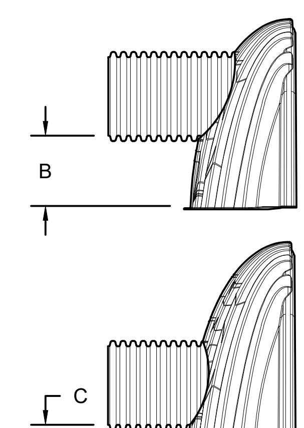
SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.8"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

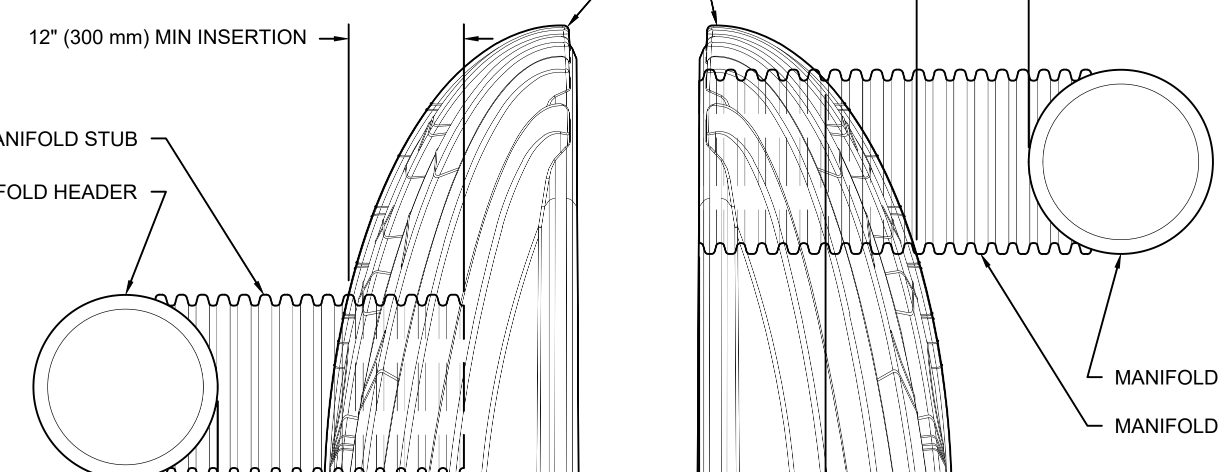
PART #	STUB	B	C
MC4500IEPP06T	6" (150 mm)	42.54" (1081 mm)	---
MC4500IEPP06B		---	0.86" (22 mm)
MC4500IEPP08T	8" (200 mm)	40.50" (1029 mm)	---
MC4500IEPP08B		---	1.01" (26 mm)
MC4500IEPP10T	10" (250 mm)	38.37" (975 mm)	---
MC4500IEPP10B		---	1.33" (34 mm)
MC4500IEPP12T	12" (300 mm)	35.69" (907 mm)	---
MC4500IEPP12B		---	1.55" (39 mm)
MC4500IEPP15T	15" (375 mm)	32.72" (831 mm)	---
MC4500IEPP15B		---	1.70" (43 mm)
MC4500IEPP18T	18" (450 mm)	29.36" (746 mm)	---
MC4500IEPP18TW			
MC4500IEPP18B		---	1.97" (50 mm)
MC4500IEPP18BW			
MC4500IEPP24T	24" (600 mm)	23.05" (585 mm)	---
MC4500IEPP24TW			
MC4500IEPP24B		---	2.26" (57 mm)
MC4500IEPP24BW			
MC4500IEPP30BW	30" (750 mm)	---	2.95" (75 mm)
MC4500IEPP36BW	36" (900 mm)	---	3.25" (83 mm)
MC4500IEPP42BW	42" (1050 mm)	---	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PARTIAL CUT INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-4500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

MC-SERIES END CAP INSERTION DETAIL
NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

MAVERICK VICTORVILLE
VICTORVILLE, CA

DRAWN: GC
CHECKED: N/A
DATE:
PROJECT #:

REV	DRW	CHK	DESCRIPTION

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Appendix D: Geotechnical Report

CMT ENGINEERING LABORATORIES

ENGINEERING •GEOTECHNICAL •ENVIRONMENTAL (ESA I & II) •
MATERIALS TESTING •SPECIAL INSPECTIONS •
ORGANIC CHEMISTRY • PAVEMENT
DESIGN •GEOLOGY

GEOTECHNICAL ENGINEERING STUDY

Proposed Maverik Store

NWC of Mariposa Road and Nisqualli Road
Victorville, California

CMT PROJECT NO. 15198

FOR:
Cardno, Inc.
1142 West 2320 South, Suite A
West Valley City, Utah 84119

September 10, 2020

CMT ENGINEERING LABORATORIES

September 10, 2020

Mr. Russ Hamblin
Cardno, Inc.
1142 West 2320 South, Suite A
West Valley City, Utah 84119

Subject: Geotechnical Engineering Study
Proposed Maverik Store
NWC of Mariposa Road & Nisqualli Road
Victorville, California
CMT Project Number: 15198

Mr. Hamblin:

Submitted herewith is the report of our geotechnical engineering study for the subject site. This report contains the results of our findings and an engineering interpretation of the results with respect to the available project characteristics. It also contains recommendations to aid in the design and construction of the earth related phases of this project.

On August 22, 2020, a total of 6 bore holes were drilled at the site extending to depths between about 5.0 to 71.5 feet below the existing ground surface. Soil samples were obtained in the bore holes during the field operations and subsequently transported to our laboratory for further testing and observation.

Natural soils consisted of SAND (SM, SP-SM), and an occasional CLAY (CL) or SILT (ML) layer. Groundwater was not encountered within the bore holes. Based upon the results of our study the proposed structures may be supported on conventional strip and spread footings founded entirely on suitable, undisturbed natural soils, or on engineered fill extending to natural soils. A detailed discussion of design and construction criteria is presented in this report.

We appreciate the opportunity to work with you at this stage of the project. CMT offers a full range of Geotechnical Engineering, Geological, Material Testing, Special Inspection services, and Phase I and II Environmental Site Assessments. With offices throughout Utah, Idaho, and Arizona, our staff is capable of efficiently serving your project needs. If we can be of further assistance or if you have any questions regarding this project, please do not hesitate to contact us at (801) 492-4132.

Sincerely,
CMT Engineering Laboratories

Jeffrey J. Egbert, P.E. (UT), LEED A.P., M. ASCE
Senior Geotechnical Engineer

Reviewed By:

REGISTERED PROFESSIONAL ENGINEER
WILLIAM G. TURNER
No. C 43740
Exp. 3/1/21
CIVIL
STATE OF CALIFORNIA

William G. Turner, P.E. (CA C43740)
Senior Geotechnical Engineer

CMT ENGINEERING LABORATORIES

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 General

CMT Engineering Laboratories (CMT) was retained to conduct a geotechnical subsurface study for a proposed Maverik Store. The site is situated at the northwest corner of the intersection of Mariposa Road and Nisqualli Road in Victorville, California as shown in the **Vicinity Map** below.

VICINITY MAP

1.2 Objectives, Scope and Authorization

The objectives and scope of our study were planned in communications between Mr. Russ Hamblin of Cardno, Inc., and Mr. Jeffrey Egbert of CMT Engineering Laboratories (CMT). In general, the objectives of this study were to define and evaluate the subsurface soil and groundwater conditions at the site, and provide appropriate foundation, earthwork, pavement and seismic recommendations to be utilized in the design and construction of the proposed development.

In accomplishing these objectives, field explorations were performed on the site by Cardno, which consisted of the drilling/logging/sampling of 6 bore holes. Our scope of work included performing laboratory testing on samples of the subsurface soils collected in the bore holes as provided to us, and conducting an office program which included correlating available data, performing engineering analyses, and preparing this summary report.

1.3 Description of Proposed Construction

We understand that the proposed construction consists of a new Maverik convenience store and fuel station with accompanying fuel islands and canopies, and underground fuel storage tanks. We project that wall loads for the store building will not exceed 4,000 pounds per linear foot. Floor slab loads are anticipated to be relatively light, with an average uniform loading not exceeding 150 pounds per square foot.

The fuel island canopies will be supported by steel frames and columns extending to the foundation system. It is projected that the maximum canopy downward column loads will be on the order of 60,000 pounds. In addition, uplift and lateral loads will be imposed upon these foundations.

If the loading conditions are different than we have projected, please notify us so that any appropriate modifications to our conclusions and recommendations contained herein can be made.

We also understand the parking/drive paved areas will utilize both asphalt and concrete pavement. Concrete pavement will likely be installed in front of the proposed store structure, as well as in the canopy fuel islands and over the underground storage tank area. In other areas, asphalt concrete sections will likely be used. Traffic is projected to consist of mostly automobiles and light trucks (1,100/day), a few daily medium-weight delivery trucks (2/day), multiple fuel delivery trucks and semi-trucks (50/day), a weekly garbage truck, and an occasional fire truck.

1.4 Executive Summary

The most significant geotechnical aspects regarding site development include the following:

1. Topsoil on the surface, about 6 inches in thickness, to be removed.
2. Subsurface natural soils consisted predominately of SAND (SC, SM, SP-SM), with occasional layers of CLAY (CL) and SILT (ML), extending to the bottom of the bore holes.
3. Groundwater was not encountered to the maximum depth explored of about 71.5 feet below the surface.
4. The potential for liquefaction to occur in the soils we encountered is low.
5. Conventional foundations for the proposed structures can be supported on suitable, undisturbed natural sand soils, or entirely on engineered fill placed on suitable, undisturbed natural soils.

A qualified geotechnical engineer must assess that non-engineered fill (if encountered), topsoil, debris, disturbed or unsuitable soils have been removed and that suitable soils have been encountered prior to placing structural/site grading fills, footings, slabs, and pavements.

In the following sections, detailed discussions pertaining to the site and subsurface descriptions, geologic/seismic setting, earthwork, foundations, lateral resistance, lateral pressure, floor slabs, and pavements are provided.

2.0 FIELD EXPLORATION

2.1 General

In order to define and evaluate the subsurface soil and groundwater conditions, 6 bore holes were drilled at the site to depths of approximately 5.0 to 71.5 feet below the existing ground surface. Locations of the bore holes are presented on **Figure 1**.

Samples of the subsurface soils encountered in the bore holes were collected at varying depths through the hollow stem drill augers. Relatively undisturbed samples of the subsurface soils were obtained by driving a split-spoon sampler with 2.5-inch outside diameter rings/liners into the undisturbed soils below the drill augers. Disturbed samples were collected utilizing a standard split spoon sampler. This standard split spoon sampler was driven 18 inches into the soils below the drill augers using a 140 pound hammer free-falling a distance of 30 inches. The number of hammer blows needed for each 6 inch interval was recorded. The sum of the hammer blows for the final 12 inches of penetration is known as a standard penetration test (SPT) and this 'blow count' was recorded on the bore hole logs. Where more than 50 blows occurred before the 6-inch interval was achieved, the sampling was terminated and the number of blows and inches penetrated by the sampler were recorded. The blow count provides a reasonable approximation of the relative density of granular soils, but only a limited indication of the relative consistency of fine grained soils because the consistency of these soils is significantly influenced by the moisture content.

The subsurface soil samples retrieved in the bore holes were classified in the field based upon visual and textural examination in general accordance with ASTM[1] D-2488. These field classifications were supplemented by subsequent examination and testing of select samples in our laboratory. Graphic logs of the bore holes, including a description of the soil strata encountered, are presented on the Bore Hole Logs, **Figures 2 through 7**, included in the Appendix. Sampling information and other pertinent data and observations are also included on the logs. In addition, a Key to Symbols defining the terms and symbols used on the logs is provided as **Figure 8** in the Appendix.

2.2 Infiltration Testing

Infiltration testing was also performed in bore hole B-6 within natural sand soils. The testing consisted of drilling to 5 feet below the surface, removing the auger, filling the hole with water, allowing it to soak for several hours, then filling the hole again and measuring the rate of water drop over a certain time period (i.e. every 15 minutes). The final measured rate was approximately 1.5 minutes per inch.

[1]American Society for Testing and Materials

3.0 LABORATORY TESTING

Selected samples of the subsurface soils were subjected to various laboratory tests to assess pertinent engineering properties, as follows:

1. Moisture Content, ASTM D-2216, Percent moisture representative of field conditions
2. Dry Density, ASTM D-2937, Dry unit weight representing field conditions
3. Atterberg Limits, ASTM D-4318, Plasticity and workability
4. Gradation Analysis, ASTM D-1140/C-117, Grain Size Analysis

Laboratory test results are presented on the bore hole logs (**Figures 2 through 7**) and in the following Lab Summary Table:

LAB SUMMARY TABLE

Bore Hole	Depth (feet)	Sample Type	Soil Class	Moisture Content (%)	Dry Denstiy (pcf)	Gradation			Atterberg Limits		
						Grav	Sand	Fines	LL	PL	PI
B-1	7	SPT	SC	9				41	30	19	11
	10	Rings	SC	5	121						
	20	SPT	SP-SM	1		18	75	7			
	50	SPT	SM	4				23			
	60	SPT	SM	3						NP	
B-2	5	Rings	SM	4	114			27			
	15	SPT	CL	6					27	19	8
B-3	2.5	SPT	SM	3				29			
	10	SPT	ML	5						NP	
B-4	4	SPT	SM	4				20			
B-5	0	SPT	SM	1				23			

4.0 GEOLOGIC & SEISMIC CONDITIONS

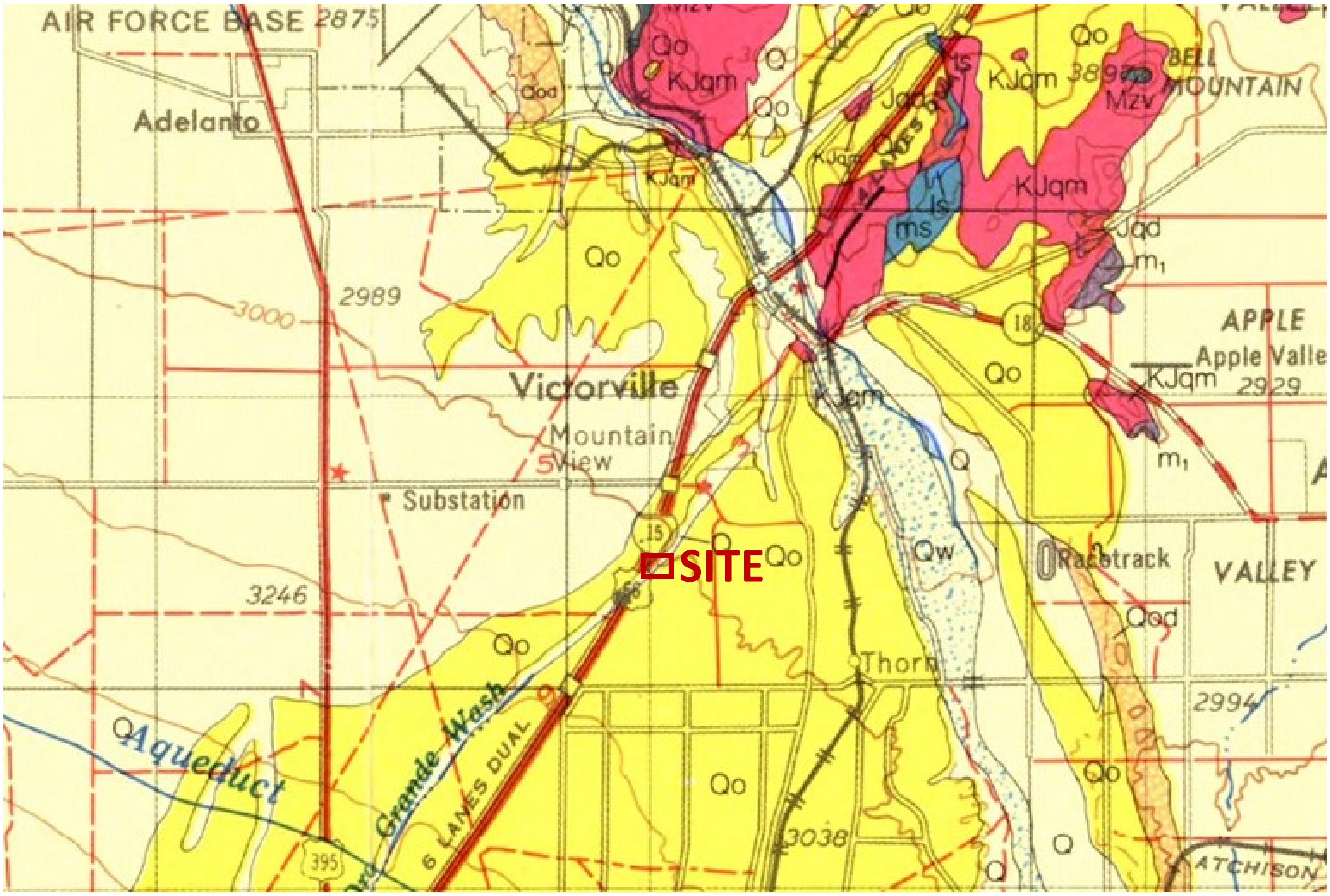
4.1 Geologic Setting

The subject site is located in the western portion of the Mojave Desert Geomorphic Province in southern California. The area of the subject site is a generally broad, flat area with interspersed hilly terrain and relatively low-relief mountains. The San Gabriel Mountains lie to the south of the area. The site sits at an elevation of approximately 3,066 feet above sea level.

The geology of the San Bernardino Sheet of the Geologic Map of California, that includes the location of the subject site, has been mapped by Bortugno and Spittler[2]. The geology at the location of the site and adjacent properties is mapped as "Older alluvium, undifferentiated" (Map Unit Qo) loosely dated as upper Pleistocene.

[2] Rogers, T.H., 1967, Geologic Map of the San Bernardino Quadrangle, California; California Division of Mines and Geology, Regional Geologic Map Series, Map No. 3A, Scale 1:250,000.

The referenced map does not provide a more detailed description of Unit Qo. Refer to the **Geologic Map**., shown below.



GEOLOGIC MAP

4.2 Faulting

An interactive hazards map from the California Geological Survey[3] was reviewed. No fault traces are shown on the referenced geologic map crossing, adjacent to, or projecting toward the subject site. The nearest mapped active (Holocene) fault appears to be the Ord Mountains Fault Zone approximately 9.3 miles to the southeast.

4.3 Seismicity

4.3.1 Site Class

We understand that the State of California Building Code (SCBC) 2019 was adopted on January 1, 2020, which we anticipate will be the code for design of the structures at this site. SCBC 2019 refers to Chapter 20, Site

[3] https://maps.conservation.ca.gov/cgs/DataViewer/

Classification Procedure for Seismic Design, of ASCE[4] 7-16, which stipulates that the average values of shear wave velocity, blow count and/or shear strength within the upper 100 feet (30 meters) be utilized to determine seismic site class. Based on average shear wave velocity data within the upper 30 meters ($V_{S,30}$) provided in the interactive hazards map from the California Geological Survey[3], the subject site has a $V_{S,30}$ of 293 meters per second (961 feet per second), which fits Site Class D. In addition, given the average blow counts and subsurface soils encountered within the maximum depth explored of 71.5 feet at the site, it is our opinion the site best fits Site Class D – Stiff Soil (with data), which we recommend for seismic structural design.

4.3.2 Ground Motions

The seismic mapping utilized by the California Building Code provides values of peak ground, short period and long period spectral accelerations for the Site Class B/C boundary and the Risk-Targeted Maximum Considered Earthquake (MCE_R). This Site Class B/C boundary represents average bedrock values for the Western United States and must be corrected for local soil conditions at site grid coordinates of 34.4861 degrees north latitude and -117.3331 degrees west longitude. The following table summarizes the peak ground, short period and long period accelerations for the MCE_R event, and incorporates appropriate soil correction factors for a Site Class D (with data) soil profile:

SPECTRAL ACCELERATION PERIOD, T	SITE CLASS B/C BOUNDARY [mapped values] (g)	SITE COEFFICIENT	SITE CLASS D* [adjusted for site class effects] (g)	MULTI-PLIER	DESIGN VALUES (g)
Peak Ground Acceleration	PGA = **0.500**	F_{pga} = 1.100	PGA_M = 0.550	1.000	PGA_M = 0.550
0.2 Seconds (Long Period Acceleration)	S_S = **1.247**	F_a = 1.001	S_{MS} = 1.248	0.667	S_{DS} = 0.832
	(no exceptions needed)	F_a = (N/A)	S_{MS} = (N/A)	0.667	S_{DS} = (N/A)
1.0 Second (Long Period Acceleration)	S_1 = **0.482**	F_v = N/A	S_{M1} = N/A	0.667	S_{D1} = N/A
	(Exception 2:)	F_v = (1.818)	S_{M1} = (0.876)	0.667	S_{D1} = (0.584)

NOTES: 1. TL (seconds): **8**
2. Site Class: **D**
3. Have data to verify? **yes**

*** Site Class D With Data**

4. ASCE 7-16 Requires Site-Specific Ground Motion Hazard Analysis (Since S1≥0.2 sec) - OR Can Use Exception 2 (per §11.4.8)

As indicated in the above table, S_1 is greater than 0.2 seconds and a site-specific ground motion hazard analysis (GMHA) is required for the site, unless the Exception 2 values shown are used for seismic design. If a site-specific GMHA is desired instead of using the higher exception values, please contact CMT for a proposal to perform the GMHA.

4.3.3 Liquefaction

Liquefaction is defined as the condition when saturated, loose, sandy soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event. Clayey soils, even if saturated, will generally not liquefy during a major seismic event.

[4] American Society of Civil Engineers

Groundwater was not encountered to the maximum depth explored of 71.5 feet. Based upon this condition, we estimate a very low liquefaction potential or the soils we encountered at this site.

4.4 Other Geologic Hazards

No landslide deposits or features, including lateral spread deposits, are mapped on or adjacent to the site. The site is not located within a known or mapped potential debris flow, stream flooding[5], or rock fall hazard area.

5.0 SITE CONDITIONS

5.1 Surface Conditions

At the time the bore holes were drilled, the site was undeveloped land vegetated with grasses and weeds. The site grade was relatively flat and tens of feet below the adjacent roads. Based on aerial photos dating back to 1993 that are readily available on the internet, Mariposa Road was constructed between 2009 and 2013, and it appears the site grade was lowered as part of the construction. It has since remained undeveloped. The site is bordered on the north by undeveloped land, on the south by Nisqualli Road, on the east by Mariposa Road, and on the west by the northbound Interstate 15 on ramp (see **Vicinity Map** in **Section 1.1** above).

5.2 Subsurface Soils

Approximately 6 inches of sandy topsoil was encountered at the surface across the site. The natural soils encountered below the topsoil predominately consisted of Clayey SAND (SC), Silty SAND (SM), and Poorly Graded SAND with silt (SP-SM) layers. An occasional layer of CLAY (CL) or SILT (ML) was also encountered.

The natural sand soils were slightly moist, red-brown/brown/light brown/light gray-brown in color, and appear to range in relative density from medium dense to very dense based upon the SPT blow counts.

The clay and silt layers were slightly moist to moist, brown to light brown in color, and of medium stiff (estimated) to hard consistency based upon the SPT blow counts.

For a more descriptive interpretation of subsurface conditions, please refer to the bore hole logs, **Figures 2 through 7**, which graphically represent the subsurface conditions encountered. The lines designating the interface between soil types on the log generally represent approximate boundaries; in situ, the transition between soil types may be gradual.

5.3 Groundwater

Groundwater was not encountered to the maximum depth explored of approximately 71.5 feet below the surface. Based upon this condition we do not expect groundwater to be encountered during construction.

[5] https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd&extent=-111.36752238312305,40.474000783564726,-111.34675135651116,40.48216171946493

Groundwater levels can fluctuate seasonally and in response to numerous factors such as heavy precipitation, irrigation of neighboring land, and other unforeseen factors. The detailed evaluation of these and other factors, which may be responsible for ground water fluctuations, is beyond the scope of this study.

5.4 Site Subsurface Variations

Based on the results of the subsurface explorations and our experience, variations in the continuity and nature of subsurface conditions should be anticipated. Due to the heterogeneous characteristics of natural soils, care should be taken in interpolating or extrapolating subsurface conditions between or beyond the exploratory locations.

6.0 SITE PREPARATION AND GRADING

6.1 General

All deleterious materials should be stripped from the site prior to commencement of construction activities. This includes loose and disturbed soils, topsoil, vegetation, etc. Based upon the conditions observed in the bore holes there is topsoil on the surface of the site which we estimated to be about 6 inches in thickness. When stripping and grubbing, topsoil should be distinguished by the apparent organic content and not solely by color; thus we estimate that topsoil stripping will need to include at least the upper 4 inches.

In pavement areas we recommend that the subgrade be proofrolled by passing moderate-weight rubber tire-mounted construction equipment over the surface at least twice. If excessively soft or loose soils are encountered, they must be removed (up to a maximum depth of 2 feet) and replaced with structural fill. The removed soils may then be replaced as properly moisture conditioned (to within 0 to 2% above optimum moisture) and compacted structural fill, or imported structural fill may be used.

Fill placed over large areas to raise overall site grades can induce settlements in the underlying natural soils. If more than 3 feet of site grading fill is anticipated over the existing ground surface, we should be notified to assess potential settlements and provide additional recommendations as needed. These recommendations may include placement of the site grading fill far in advance to allow potential settlements to occur prior to construction.

6.2 Temporary Excavations

Excavations up to 16 feet deep for the underground fuel storage tanks are anticipated at the site.

For sandy (cohesionless) soils, temporary construction excavations not exceeding 4 feet in depth should be no steeper than one-half horizontal to one vertical (0.5H:1V). For excavations up to 16 feet and above groundwater, side slopes should be no steeper than one horizontal to one vertical (1H:1V). Excavations encountering saturated cohesionless soils will be very difficult to maintain, and will require very flat side slopes and/or shoring, bracing and dewatering.

In clay (cohesive) soils, temporary construction excavations not exceeding 4 feet in depth may be constructed with near-vertical side slopes. Temporary excavations up to 16 feet deep, above or below groundwater, may be constructed with side slopes no steeper than one horizontal to one vertical (1H:1V).

All excavations must be inspected periodically by qualified personnel. If any signs of instability or excessive sloughing are noted, immediate remedial action must be initiated. All excavations should be made following OSHA safety guidelines.

6.3 Fill Material

The table below contains our recommendations for the various fill types we anticipate will be used at this site:

FILL MATERIAL TYPE	DESCRIPTION | RECOMMENDED SPECIFICATION
Structural Fill	Placed below structures, flatwork and pavement. Well-graded sand/gravel mixture, with maximum particle size of 4 inches, a minimum 70% passing 3/4-inch sieve, a maximum 20% passing the No. 200 sieve, and a maximum Plasticity Index of 10.
Site Grading Fill	Placed over larger areas to raise the site grade. Sandy to gravelly soil, with a maximum particle size of 6 inches, a minimum 70% passing 3/4-inch sieve, a maximum 50% passing No. 200 sieve and a maximum Plasticity Index of 15.
Non-Structural Fill	Placed below non-structural areas, such as landscaping. On-site soils or imported soils, with a maximum particle size of 8 inches, including silt/clay soils not containing excessive amounts of degradable/organic material (see discussion below).
Stabilization Fill	Placed to stabilize soft areas prior to placing structural fill and/or site grading fill. Coarse angular gravels and cobbles 1 inch to 8 inches in size. May also use 1.5- to 2.0-inch gravel placed on stabilization fabric, such as Mirafi RS280i or equivalent (see **Section 6.6**).

The natural sand soils (SM, SP-SM) at this site may be suitable for use as structural fill and site grading fill, if found to meet the specifications given above. All on-site soils could be used as non-structural fill but the finer grained soils (CL, ML) could be more difficult to work with. If utilized, these soils should be compacted to the same requirements as imported engineered fill as recommended below.

All fill material should be approved by a geotechnical engineer prior to placement.

6.4 Fill Placement and Compaction

The various types of compaction equipment available have their limitations as to the maximum lift thickness that can be compacted. For example, hand operated equipment is limited to lifts of about 4 inches and most “trench compactors” have a maximum, consistent compaction depth of about 6 inches. Large rollers, depending on soil and moisture conditions, can achieve compaction at 8 to 12 inches. The full thickness of each lift should be compacted to at least the following percentages of the maximum dry density as determined by ASTM D-1557 (or AASHTO[6] T-180) in accordance with the following recommendations:

[6] American Association of State Highway and Transportation Officials

LOCATION	TOTAL FILL THICKNESS (FEET)	MINIMUM PERCENTAGE OF MAXIMUM DRY DENSITY
Beneath an area extending at least 4 feet beyond the perimeter of structures, and below flatwork and pavement (applies to structural fill and site grading fill) extending at least 2 feet beyond the perimeter	0 to 6	95
Site grading fill outside area defined above	0 to 6	92
Utility trenches within structural areas	--	96
Roadbase and subbase	-	96
Non-structural fill	0 to 6	90

Structural fills greater than 6 feet thick are not anticipated at the site. For best compaction results, we recommend that the moisture content for structural fill/backfill be within 2% of optimum. Field density tests should be performed on each lift as necessary to verify that proper compaction is being achieved.

6.5 Utility Trenches

For the bedding zone around the utility, we recommend utilizing sand bedding fill material that meets current local or APWA[7] requirements.

All utility trench backfill material below structurally loaded facilities (foundations, floor slabs, flatwork, parking lots/drive areas, etc.) should be placed at the same density requirements established for structural fill in the previous section.

Most utility companies and local governments are requiring Type A-1a or A-1b (AASHTO Designation) soils (sand/gravel soils with limited fines) be used as backfill over utilities within public rights of way, and the backfill be compacted over the full depth above the bedding zone to at least 96% of the maximum dry density as determined by AASHTO T-180 (ASTM D-1557).

6.6 Stabilization

If rutting or pumping occurs, traffic should be stopped and the disturbed soils should be removed and replaced with stabilization material. Typically, a minimum of 18 inches of the disturbed soils must be removed to be effective. However, deeper removal is sometimes required.

To stabilize soft subgrade conditions a mixture of coarse, clean, angular gravels and cobbles and/or 1.5- to 2.0-inch clean gravel should be utilized. Often the amount of gravelly material can be reduced with the use of a geotextile fabric such as Mirafi RS280i, or equivalent. Its use will also help avoid mixing of the subgrade soils with the gravelly material. After excavating the soft/disturbed soils, the fabric should be spread across the bottom of the excavation and up the sides a minimum of 18 inches. Otherwise, it should be placed in accordance

[7] American Public Works Association

with the manufacturer's recommendation, including proper overlaps. The gravel material can then be placed over the fabric in compacted lifts as described above.

7.0 FOUNDATION RECOMMENDATIONS

The following recommendations have been developed on the basis of the previously described project characteristics, the subsurface conditions observed in the field and the laboratory test data, as well as common geotechnical engineering practice.

7.1 Foundation Recommendations

Based on our geotechnical engineering analyses, the proposed structures may be supported upon conventional spread and/or continuous wall foundations placed entirely on suitable undisturbed natural sand soils, or entirely on structural fill extending to undisturbed natural soils. Footings may be designed using a net bearing pressure of 2,000 psf. The term "net bearing pressure" refers to the pressure imposed by the portion of the structure located above lowest adjacent final grade, thus the weight of the footing and backfill to lowest adjacent final grade need not be considered. The allowable bearing pressure may be increased by 1/3 for temporary loads such as wind and seismic forces.

We also recommend the following:

1. Exterior footings subject to frost should be placed at least 12 inches below final grade.
2. Interior footings not subject to frost should be placed at least 8 inches below grade.
3. Continuous footing widths should be maintained at a minimum of 18 inches.
4. Spot footings should be a minimum of 24 inches wide.

7.2 Installation

Under no circumstances shall foundations be placed on non-engineered fill (if encountered), topsoil with organics, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. If unsuitable soils are encountered, they must be completely removed and replaced with properly compacted structural fill. The base of footing excavations and floor slab sub grades should be observed by a qualified geotechnical engineer to confirm that suitable bearing soils have been exposed.

All structural fill should meet the requirements for such, and should be placed and compacted in accordance with **Section 6** above. The width of structural replacement fill below footings should be equal to the width of the footing plus 1 foot for each foot of fill thickness. For instance, if the footing width is 2 feet and the structural fill depth beneath the footing is 4 feet, the fill replacement width should be 6 feet, centered beneath the footing.

The minimum thickness of structural fill below footings should be equivalent to one-third the thickness of structural fill below any other portion of the foundations. For example, if the maximum depth of structural fill is 6 feet, all footings for the new structure should be underlain by a minimum 2 feet of structural fill.

7.3 Estimated Settlement

Foundations designed and constructed in accordance with our recommendations could experience some settlement, but we anticipate that total settlements of footings founded as recommended above will not exceed 1 inch. We project that approximately 50% of the total settlement will initially take place during construction.

7.4 Lateral Resistance

Lateral loads imposed upon foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footings and the supporting soils. In determining frictional resistance, a coefficient of 0.40 for structural fill, may be utilized for design. Passive resistance provided by properly placed and compacted structural fill above the water table may be considered equivalent to a fluid with a density of 425 pcf. A combination of passive earth resistance and friction may be utilized if the friction component of the total is divided by 1.5.

8.0 LATERAL EARTH PRESSURES

We anticipate that below-grade walls up to 4 feet high may be constructed at this site. The lateral earth pressure values given in the table below are for a backfill material that will consist of drained sand/gravel soils (less than 10% passing No. 200 sieve) placed and compacted in accordance with the recommendations presented herein. If other soil types will be used as backfill, we should be notified so that appropriate modifications to these values can be provided, as needed.

The lateral pressures imposed upon subgrade facilities will depend upon the relative rigidity and movement of the backfilled structure. Following are the recommended lateral pressure values, which also assume that the soil surface behind the wall is horizontal and that the backfill within 3 feet of the wall will be compacted with hand-operated compacting equipment.

CONDITION	STATIC (psf/ft)*	SEISMIC (psf)**
Active Pressure (wall is allowed to yield, i.e. move away from the soil, with a minimum 0.001H movement/rotation at the top of the wall, where "H" is the total height of the wall)	35	52
At-Rest Pressure (wall is not allowed to yield)	55	138
Passive Pressure (wall moves into the soil)	425	425

*Equivalent Fluid Pressure (applied at 1/3 Height of 4-foot High Wall)
**Uniform Pressure, Seismic Only (applied at 1/2 Height of 4-foot High Wall)

9.0 BOUYANT FORCES

Groundwater was not encountered in our explorations. Based upon this condition we anticipate that underground tanks will not need to be designed to resist buoyant forces.

10.0 FLOOR SLABS

Floor slabs may be supported on suitable, undisturbed natural sand soils, or on structural fill extending to natural soils (same as for foundations). Under no circumstances shall floor slabs be established directly on any topsoil, non-engineered fills, loose or disturbed soils, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water.

In order to facilitate curing of the concrete, we recommend that floor slabs placed on structural fill be directly underlain by at least 4 inches of "free-draining" fill, such as "pea" gravel or 3/4-inch quarters to 1-inch minus, clean, gap-graded gravel. To help control normal shrinkage and stress cracking, the floor slabs should have the following features:

1. Adequate reinforcement for the anticipated floor loads with the reinforcement continuous through interior floor joints;
2. Frequent crack control joints; and
3. Non-rigid attachment of the slabs to foundation walls and bearing slabs.

11.0 DRAINAGE RECOMMENDATIONS

It is important to the long-term performance of foundations and floor slabs that water not be allowed to collect near the foundation walls and infiltrate into the underlying soils. We recommend the following:

1. All areas around the structures should be sloped to provide drainage away from the foundations. We recommend a minimum slope of 4 inches in the first 10 feet away from the structure. This slope should be maintained throughout the lifetime of the structure.

2. All roof drainage should be collected in rain gutters with downspouts designed to discharge at least 10 feet from the foundation walls or well beyond the backfill limits, whichever is greater.

3. Adequate compaction of the foundation backfill should be provided. We suggest a minimum of 90% of the maximum laboratory density as determined by ASTM D-1557. Water consolidation methods should not be used under any circumstances.

4. Landscape sprinklers should be aimed away from the foundation walls. The sprinkling systems should be designed with proper drainage and be well-maintained. Over watering should be avoided.

5. Other precautions that may become evident during construction.

12.0 PAVEMENTS

All pavement areas must be prepared as discussed above in **Section 6.1**. Under no circumstances shall pavements be established over topsoil, non-engineered fill, loose or disturbed soils, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water.

We anticipate the near surface sand soils will exhibit fair pavement support characteristics when saturated or nearly saturated. Based on our laboratory testing experience with similar soils, our pavement design is based upon a Resistance (R) value of about 8 (approximate California Bearing Ratio of 40).

Given the projected traffic as discussed above in **Section 1.3**, the following pavement sections are recommended for the estimated Traffic Indices (TI):

MATERIAL	PAVEMENT SECTION THICKNESS (INCHES)					
	PARKING AREAS (T.I. = 5.0)			DRIVE/TRUCK AREAS (T.I. = 9.0)		
Asphalt	3	3	---	6	6	---
Concrete	---	--	5	---	---	7
Road-Base	10	6	6	9	6	8
Subbase	0	6	0	0	6	0
Total Thickness	13	15	11	15	18	15

Untreated base course (UTBC) should conform to city or Caltrans specifications. Material meeting our specification for structural fill can be used for subbase, as long as the fines content (percent passing No. 200 sieve) does not exceed 15%. Roadbase and subbase material should be compacted as recommended above in **Section 6.4**. Asphalt material generally should conform to Caltrans or APWA requirements.

Concrete pavement should be designed in accordance with the American Concrete Institute (ACI) and joint details should conform to the Portland Cement Association (PCA) guidelines. The concrete should have a minimum 28-day unconfined compressive strength of 4,000 pounds per square inch.

13.0 QUALITY CONTROL

We recommend that a comprehensive quality control testing and observation program be established during construction to help facilitate implementation of our recommendations and address, in a timely manner, any subsurface conditions encountered which vary from those described in this report. Without such a program CMT cannot be responsible for application of our recommendations to subsurface conditions which may vary from those described herein. This program may include, but not necessarily be limited to, the following:

13.1 Field Observations

Observations should be completed during all phases of construction such as site preparation, foundation excavation, structural fill placement and concrete placement.

13.2 Fill Compaction

Compaction testing is required for all structural supporting fill materials. Maximum Dry Density (Modified Proctor, ASTM D-1557) tests should be requested by the contractor immediately after delivery of any fill materials. The maximum density information should then be used for field density tests on each lift as necessary to ensure that the required compaction is being achieved.

13.3 Excavations

All excavation procedures and processes should be observed by a geotechnical engineer. In addition, for the recommendations in this report to be valid, all backfill and structural fill placed in trenches and all pavements should be density tested. We recommend that freshly mixed concrete be tested in accordance with ASTM designations.

14.0 LIMITATIONS

The recommendations provided herein were developed by evaluating the information obtained from the subsurface explorations and soils encountered therein. The exploration logs reflect the subsurface conditions only at the specific location at the particular time designated on the logs. Soil and ground water conditions may differ from conditions encountered at the actual exploration locations. The nature and extent of any variation in the explorations may not become evident until during the course of construction. If variations do appear, it may become necessary to re-evaluate the recommendations of this report after we have observed the variation.

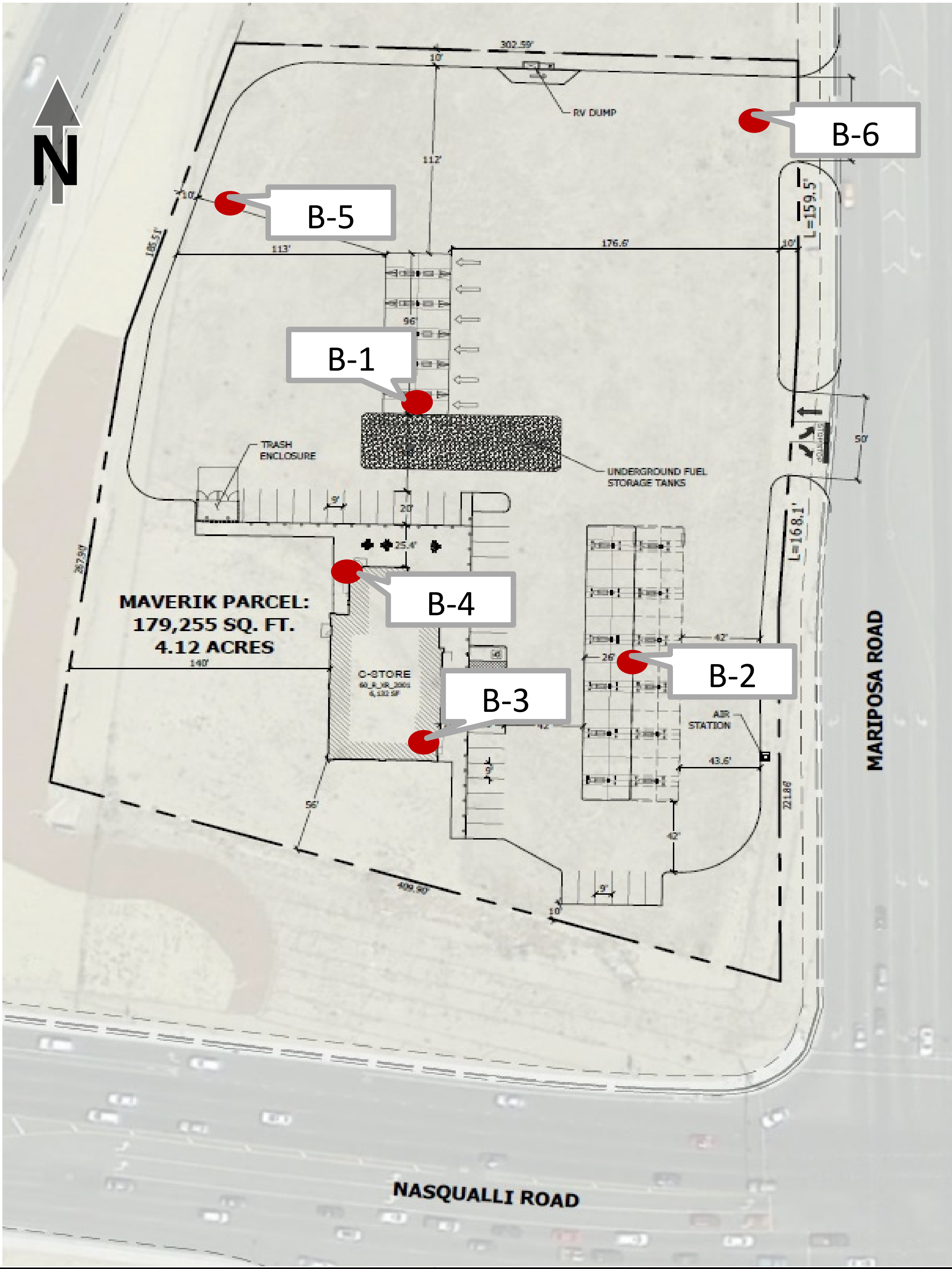
Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

We appreciate the opportunity to be of service to you on this project. If we can be of further assistance or if you have any questions regarding this project, please do not hesitate to contact us at (801) 492-4132.

APPENDIX

SUPPORTING

DOCUMENTATION



Maverik Store	CMT ENGINEERING LABORATORIES			Figure:
NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA	**Site Plan**	Date:	9-Sep-20	1
		Job #	15198	

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-1

Total Depth: 71.5'
Water Depth: (see Remarks)
Date: 8/22/20
Job #: 15198

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0	TOPSOIL: Sand, silt, roots, organics, slighty moist, brown												
	Silty SAND (SM), slightly moist, red-brown												
	medium dense		1	4 5 6	11								
4													
	dense		2	7 13 20	33								
8	Clayey SAND (SC), slightly moist, brown — dense		3	12 21 28	49	9				41	30	19	11
	very dense		4	37 50/5"	50+	5	121						
12													
16			5	17 24 28	52								
20	Poorly Graded SAND with silt (SP-SM), slightly moist, light gray-brown — dense		6	9 16 22	38	1		18	75	7			
24													
			7	13 17 21	38								
28													

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 2

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-1

Total Depth: 71.5'
Water Depth: (see Remarks)

Date: 8/22/20
Job #: 8/10/41

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
28	Poorly Graded SAND with silt (SP-SM), slightly moist, light gray-brown												
	dense		8	8 15 24	39								
32													
	Silty SAND (SM), slightly moist, light brown medium dense		9	8 12 17	29								
36													
40			10	8 15 17	32								
44			11	8 12 17	29								
48													
	dense		12	12 19 28	47	4				23			
52													
56			13	13 22	46								

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 2

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log — B-1

Total Depth: 71.5'
Water Depth: (see Remarks)
Date: 8/22/20
Job #: 8/10/41

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
56	Silty SAND (SM), slightly moist, light brown			24									
60	dense		14	10 19 25	44	3						NP	NP
64			15	11 18 24	42								
68	very dense		16	14 24 28	52								
72	END AT 71.5 FEET												
76													
80													
84													

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 2

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log — B-2

Total Depth: 16.5'
Water Depth: (see Remarks)
Date: 8/22/20
Job #: 15198

Depth (ft)	Soil Description		Sample Type	Sample #	Blows (N)	Blows Total	Moisture (%)	Dry Density (pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0	TOPSOIL: Sand, silt, roots, organics, slighty moist, brown													
	Silty SAND (SM), slightly moist, red-brown													
		medium dense		17	6 12 15	27								
4														
		very dense		18	38 50/3"	50+	4	114			27			
8				19	15 30 36	66								
		medium dense		20	16 28									
12														
	Sandy CLAY (CL), moist, brown blow counts not recorded	medium stiff?		21			6					27	19	8
16														
	END AT 16.5 FEET													
20														
24														
28														

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 3

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-3

Total Depth: 11.5'
Water Depth: (see Remarks)
Date: 8/22/20
Job #: 15198

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0	TOPSOIL: Sand, silt, roots, organics, slightly moist, brown												
	Silty SAND (SM), slightly moist, red-brown												
	very dense		22	15 30 31	61	3				29			
4													
	dense		23	12 19 20	39								
	Sandy SILT (ML), slightly moist, light brown — hard												
8			24	13 32 43	75								
			25	9 12 20	32	5						NP	NP
12	END AT 11.5 FEET												
16													
20													
24													
28													

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 4

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-4

Total Depth: 11'
Water Depth: (see Remarks)
Date: 8/22/20
Job #: 15198

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Blows (N) Total	Moisture (%)	Dry Density (pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0	TOPSOIL: Sand, silt, roots, organics, slightly moist, brown												
	Silty SAND (SM), slightly moist, red-brown												
	medium dense		26	3 5 8	13								
4	dense		27	11 20 25	45	4				20			
8	very dense		28	18 21 32	53								
	dense		29	16 21 24	45								
	END AT 11.0 FEET												
12													
16													
20													
24													
28													

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 5

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-5

Total Depth: 5'
Water Depth: (see Remarks)
Date: 8/22/20
Job #: 15198

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0	TOPSOIL: Sand, silt, roots, organics, slightly moist, brown												
	Silty SAND (SM), slightly moist, red-brown loose		30	4 4 4	8	1				23			
	medium dense		31	3 6 10	16								
4													
	END AT 5.0 FEET												

Depth scale: 0, 4, 8, 12, 16, 20, 24, 28

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 6

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-6

Total Depth: 5'
Water Depth: (see Remarks)

Date: 8/22/20
Job #: 15198

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0	TOPSOIL: Sand, silt, roots, organics, slightly moist, brown												
	Silty SAND (SM), slightly moist, red-brown												
	medium dense		32	6 10 11	21								
4	dense		33	9 14 18	32								
	END AT 5.0 FEET												
8													
12													
16													
20													
24													
28													

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 7

Maverik Store

Key to Symbols

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Date: 8/22/20

Job #: 15198

① Depth (ft)	② GRAPHIC LOG	③ Soil Description	④ Sample Type	⑤ Sample #	Blows(N) ⑥	⑦ Total	⑧ Moisture (%)	⑨ Dry Density(pcf)	Gradation ⑩ Gravel %	Sand %	Fines %	Atterberg ⑪ LL	PL	PI

COLUMN DESCRIPTIONS

① **Depth (ft.):** Depth (feet) below the ground surface (including groundwater depth - see water symbol below).

② **Graphic Log:** Graphic depicting type of soil encountered (see ② below).

③ **Soil Description:** Description of soils encountered, including Unified Soil Classification Symbol (see below).

④ **Sample Type:** Type of soil sample collected at depth interval shown; sampler symbols are explained below-right

⑤ **Sample #:** Consecutive numbering of soil samples collected during field exploration.

⑥ **Blows:** Number of blows to advance sampler in 6" increments, using a 140-lb hammer with 30" drop.

⑦ **Total Blows:** Number of blows to advance sampler the 2nd and 3rd 6" increments.

⑧ **Moisture (%):** Water content of soil sample measured in laboratory (percentage of dry weight of sample).

⑨ **Dry Density (pcf):** The dry density of a soil measured in laboratory (pounds per cubic foot).

⑩ **Gradation:** Percentages of Gravel, Sand and Fines (Silt/Clay), obtained from lab test results of soil passing the No. 4 and No. 200 sieves.

⑪ **Atterberg:** Individual descriptions of Atterberg Tests are as follows:

LL = Liquid Limit (%): Water content at which a soil changes from plastic to liquid behavior.

PL = Plastic Limit (%): Water content at which a soil changes from liquid to plastic behavior.

PI = Plasticity Index (%): Range of water content at which a soil exhibits plastic properties (= Liquid Limit - Plastic Limit).

STRATIFICATION	
Description	**Thickness**
Seam	Up to ½ inch
Lense	Up to 12 inches
Layer	Greater than 12 in.
Occasional	1 or less per foot
Frequent	More than 1 per foot

MODIFIERS
Trace
<5%
Some
5-12%
With
> 12%

MOISTURE CONTENT
Dry: Absence of moisture, dusty, dry to the touch.
Moist: Damp / moist to the touch, but no visible water.
Saturated: Visible water, usually soil below groundwater.

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS			USCS SYMBOLS	②	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS More than 50% of material is larger than No. 200 sieve size.	GRAVELS The coarse fraction retained on No. 4 sieve.	CLEAN GRAVELS (< 5% 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 (≥ 12% fines)	GM		Silty Gravels, Gravel-Sand-Silt Mixtures
			GC		Clayey Gravels, Gravel-Sand-Clay Mixtures
	SANDS The coarse fraction passing through No. 4 sieve.	CLEAN SANDS (< 5% fines)	SW		Well-Graded Sands, Gravelly Sands, Little or No Fines
			SP		Poorly-Graded Sands, Gravelly Sands, Little or No Fines
		SANDS WITH FINES (≥ 12% 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, Silty or Clayey Fine Sands or Clayey Silts with Slight
			CL		Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean
			OL		Organic Silts and Organic Silty Clays o f Low Plasticity
	SILTS AND CLAYS Liquid Limit greater than 50%		MH		Inorganic Silts, Micacious or Diatomacious Fine Sand or Silty Soils with Plasticity (Elastic Silts)
			CH		Inorganic Clays of High Plasticity, Fat Clays
			OH		Organic Silts and Organic Clays of Medium to High Plasticity
HIGHLY ORGANIC SOILS			PT		Peat, Humus, Swamp Soils with High Organic Contents

Note: Dual Symbols are used to indicate borderline soil classifications (i.e. GP-GM, SC-SM, etc.).

SAMPLER SYMBOLS

- Block Sample
- Bulk/Bag Sample
- Modified California Sampler 3.5" OD, 2.42" ID
- D&M Sampler
- Rock Core
- Standard Penetration Split Spoon Sampler
- Thin Wall (Shelby Tube)

WATER SYMBOL

- Encountered Water Level
- Measured Water Level

(see Remarks on Logs)

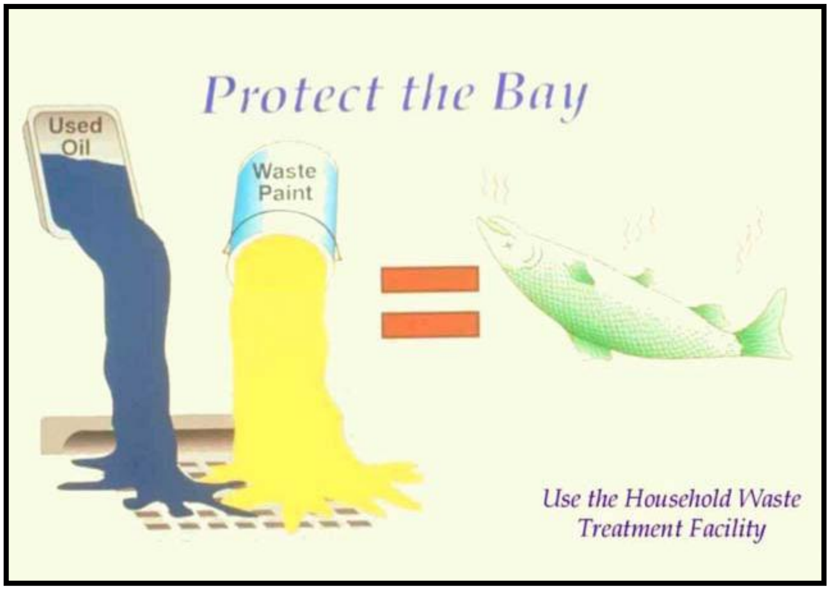
1. The results of laboratory tests on the samples collected are shown on the logs at the respective sample depths.
2. The subsurface conditions represented on the logs are for the locations specified. Caution should be exercised if interpolating between or extrapolating beyond the exploration locations.
3. The information presented on each log is subject to the limitations, conclusions, and recommendations presented in this report.

CMT ENGINEERING LABORATORIES

Figure: 8

Appendix E: Educational Materials

Non-Stormwater Discharges SC-10



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

Description

Non-stormwater discharges are those flows that do not consist entirely of stormwater. Some non-stormwater discharges do not include pollutants and may be discharged to the storm drain. These include uncontaminated groundwater and natural springs. There are also some non-stormwater discharges that typically do not contain pollutants and may be discharged to the storm drain with conditions. These include car washing, air conditioner condensate, etc. However there are certain non-stormwater discharges that pose environmental concern. These discharges may originate from illegal dumping or from internal floor drains, appliances, industrial processes, sinks, and toilets that are connected to the nearby storm drainage system. These discharges (which may include: process waste waters, cooling waters, wash waters, and sanitary wastewater) can carry substances such as paint, oil, fuel and other automotive fluids, chemicals and other pollutants into storm drains. They can generally be detected through a combination of detection and elimination. The ultimate goal is to effectively eliminate non-stormwater discharges to the stormwater drainage system through implementation of measures to detect, correct, and enforce against illicit connections and illegal discharges of pollutants on streets and into the storm drain system and creeks.

Approach

Initially the industry must make an assessment of non-stormwater discharges to determine which types must be eliminated or addressed through BMPs. The focus of the following approach is in the elimination of non-stormwater discharges.

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Pollution Prevention

- Ensure that used oil, used antifreeze, and hazardous chemical recycling programs are being implemented. Encourage litter control.

Suggested Protocols

Recommended Complaint Investigation Equipment

- Field Screening Analysis
  - pH paper or meter
  - Commercial stormwater pollutant screening kit that can detect for reactive phosphorus, nitrate nitrogen, ammonium nitrogen, specific conductance, and turbidity
  - Sample jars
  - Sample collection pole
  - A tool to remove access hole covers
- Laboratory Analysis
  - Sample cooler
  - Ice
  - Sample jars and labels
  - Chain of custody forms
- Documentation
  - Camera
  - Notebook
  - Pens
  - Notice of Violation forms
  - Educational materials

General

- Develop clear protocols and lines of communication for effectively prohibiting non-stormwater discharges, especially those that are not classified as hazardous. These are often not responded to as effectively as they need to be.

- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled or demarcated next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.

- See SC44 Stormwater Drainage System Maintenance for additional information.

Illicit Connections
- Locate discharges from the industrial storm drainage system to the municipal storm drain system through review of “as-built” piping schematics.
- Isolate problem areas and plug illicit discharge points.
- Locate and evaluate all discharges to the industrial storm drain system.

Visual Inspection and Inventory
- Inventory and inspect each discharge point during dry weather.
- Keep in mind that drainage from a storm event can continue for a day or two following the end of a storm and groundwater may infiltrate the underground stormwater collection system. Also, non-stormwater discharges are often intermittent and may require periodic inspections.

Review Infield Piping
- A review of the “as-built” piping schematic is a way to determine if there are any connections to the stormwater collection system.
- Inspect the path of floor drains in older buildings.

Smoke Testing
- Smoke testing of wastewater and stormwater collection systems is used to detect connections between the two systems.
- During dry weather the stormwater collection system is filled with smoke and then traced to sources. The appearance of smoke at the base of a toilet indicates that there may be a connection between the sanitary and the stormwater system.

Dye Testing
- A dye test can be performed by simply releasing a dye into either your sanitary or process wastewater system and examining the discharge points from the stormwater collection system for discoloration.

TV Inspection of Drainage System
- TV Cameras can be employed to visually identify illicit connections to the industrial storm drainage system.

Illegal Dumping
- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- 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.

- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- 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.

Once a site has been cleaned:

- Post "No Dumping" signs with a phone number for reporting dumping and disposal.
- Landscaping and beautification efforts of hot spots may also discourage future dumping, as well as provide open space and increase property values.
- Lighting or barriers may also be needed to discourage future dumping.
- See fact sheet SC11 Spill Prevention, Control, and Cleanup.

Inspection

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- Conduct field investigations of the industrial storm drain system for potential sources of non-stormwater discharges.
- Pro-actively conduct investigations of high priority areas. Based on historical data, prioritize specific geographic areas and/or incident type for pro-active investigations.

Reporting

- A database is useful for defining and tracking the magnitude and location of the problem.
- Report prohibited non-stormwater discharges observed during the course of normal daily activities so they can be investigated, contained, and cleaned up or eliminated.
- Document that non-stormwater discharges have been eliminated by recording tests performed, methods used, dates of testing, and any on-site drainage points observed.
- Document and report annually the results of the program.
- Maintain documentation of illicit connection and illegal dumping incidents, including significant conditionally exempt discharges that are not properly managed.

Training

- Training of technical staff in identifying and documenting illegal dumping incidents is required.
- Consider posting the quick reference table near storm drains to reinforce training.
- Train employees to identify non-stormwater discharges and report discharges to the appropriate departments.

- 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.

- Determine and implement appropriate outreach efforts to reduce non-permissible non-stormwater discharges.

- Conduct spill response drills annually (if no events occurred to evaluate your plan) in cooperation with other industries.

- When a responsible party is identified, educate the party on the impacts of his or her actions.

Spill Response and Prevention
- See SC11 Spill Prevention Control and Cleanup.

Other Considerations
- Many facilities do not have accurate, up-to-date schematic drawings.

Requirements

Costs (including capital and operation & maintenance)
- The primary cost is for staff time and depends on how aggressively a program is implemented.

- Cost for containment and disposal is borne by the discharger.

- Illicit connections can be difficult to locate especially if there is groundwater infiltration.

- Indoor floor drains may require re-plumbing if cross-connections to storm drains are detected.

Maintenance (including administrative and staffing)
- Illegal dumping and illicit connection violations requires technical staff to detect and investigate them.

Supplemental Information

Further Detail of the BMP

Illegal Dumping
- Substances illegally dumped on streets and into the storm drain systems and creeks include paints, used oil and other automotive fluids, construction debris, chemicals, fresh concrete, leaves, grass clippings, and pet wastes. All of these wastes cause stormwater and receiving water quality problems as well as clog the storm drain system itself.

- Establish a system for tracking incidents. The system should be designed to identify the following:

  - Illegal dumping hot spots

- 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

One of the keys to success of reducing or eliminating illegal dumping is increasing the number of people at the facility who are aware of the problem and who have the tools to at least identify the incident, if not correct it. Therefore, train field staff to recognize and report the incidents.

What constitutes a “non-stormwater” discharge?

- Non-stormwater discharges to the stormwater collection system may include any water used directly in the manufacturing process (process wastewater), air conditioning condensate and coolant, non-contact cooling water, cooling equipment condensate, outdoor secondary containment water, vehicle and equipment wash water, sink and drinking fountain wastewater, sanitary wastes, or other wastewaters.

Permit Requirements

- Facilities subject to stormwater permit requirements must include a certification that the stormwater collection system has been tested or evaluated for the presence of non-stormwater discharges. The State’s General Industrial Stormwater Permit requires that non-stormwater discharges be eliminated prior to implementation of the facility’s SWPPP.

Performance Evaluation

- Review annually internal investigation results; assess whether goals were met and what changes or improvements are necessary.
- Obtain feedback from personnel assigned to respond to, or inspect for, illicit connections and illegal dumping incidents.

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 Storm Water Managers Resource Center http://www.stormwatercenter.net/

Outdoor Loading/Unloading SC-30

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Description

The loading/unloading of materials usually takes place outside on docks or terminals; therefore, materials spilled, leaked, or lost during loading/unloading may collect in the soil or on other surfaces and have the potential to be carried away by stormwater runoff or when the area is cleaned. Additionally, rainfall may wash pollutants from machinery used to unload or move materials. Implementation of the following protocols will prevent or reduce the discharge of pollutants to stormwater from outdoor loading/unloading of materials.

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

- Keep accurate maintenance logs to evaluate materials removed and improvements made.
- Park tank trucks or delivery vehicles in designated areas so that spills or leaks can be contained.
- Limit exposure of material to rainfall whenever possible.
- Prevent stormwater run-on.
- Check equipment regularly for leaks.

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Suggested Protocols

Loading and Unloading – General Guidelines

- Develop an operations plan that describes procedures for loading and/or unloading.
- Conduct loading and unloading in dry weather if possible.
- Cover designated loading/unloading areas to reduce exposure of materials to rain.
- Consider placing a seal or door skirt between delivery vehicles and building to prevent exposure to rain.
- Design loading/unloading area to prevent stormwater run-on, which would include grading or berming the area, and position roof downspouts so they direct stormwater away from the loading/unloading areas.
- Have employees load and unload all materials and equipment in covered areas such as building overhangs at loading docks if feasible.
- Load/unload only at designated loading areas.
- Use drip pans underneath hose and pipe connections and other leak-prone spots during liquid transfer operations, and when making and breaking connections. Several drip pans should be stored in a covered location near the liquid transfer area so that they are always available, yet protected from precipitation when not in use. Drip pans can be made specifically for railroad tracks. Drip pans must be cleaned periodically, and drip collected materials must be disposed of properly.
- Pave loading areas with concrete instead of asphalt.
- Avoid placing storm drains in the area.
- Grade and/or berm the loading/unloading area to a drain that is connected to a deadend.

Inspection

- Check loading and unloading equipment regularly for leaks, including valves, pumps, flanges and connections.
- Look for dust or fumes during loading or unloading operations.

Training

- Train employees (e.g., fork lift operators) and contractors on proper spill containment and cleanup.
- Have employees trained in spill containment and cleanup present during loading/unloading.
- Train employees in proper handling techniques during liquid transfers to avoid spills.
- Make sure forklift operators are properly trained on loading and unloading procedures.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Contain leaks during transfer.
- Store and maintain appropriate spill cleanup materials in a location that is readily accessible and known to all and ensure that employees are familiar with the site's spill control plan and proper spill cleanup procedures.
- Have an emergency spill cleanup plan readily available.
- Use drip pans or comparable devices when transferring oils, solvents, and paints.

Other Considerations (Limitations and Regulations)

- Space and time limitations may preclude all transfers from being performed indoors or under cover.
- It may not be possible to conduct transfers only during dry weather.

Requirements

Costs

Costs should be low except when covering a large loading/unloading area.

Maintenance

- Conduct regular inspections and make repairs as necessary. The frequency of repairs will depend on the age of the facility.
- Check loading and unloading equipment regularly for leaks.
- Conduct regular broom dry-sweeping of area.

Supplemental Information

Further Detail of the BMP

Special Circumstances for Indoor Loading/Unloading of Materials

Loading or unloading of liquids should occur in the manufacturing building so that any spills that are not completely retained can be discharged to the sanitary sewer, treatment plant, or treated in a manner consistent with local sewer authorities and permit requirements.

- For loading and unloading tank trucks to above and below ground storage tanks, the following procedures should be used:
  - The area where the transfer takes place should be paved. If the liquid is reactive with the asphalt, Portland cement should be used to pave the area.
  - The transfer area should be designed to prevent run-on of stormwater from adjacent areas. Sloping the pad and using a curb, like a speed bump, around the uphill side of the transfer area should reduce run-on.

- The transfer area should be designed to prevent runoff of spilled liquids from the area. Sloping the area to a drain should prevent runoff. The drain should be connected to a dead-end sump or to the sanitary sewer. A positive control valve should be installed on the drain.

- For transfer from rail cars to storage tanks that must occur outside, use the following procedures:

  - Drip pans should be placed at locations where spillage may occur, such as hose connections, hose reels, and filler nozzles. Use drip pans when making and breaking connections.

  - Drip pan systems should be installed between the rails to collect spillage from tank cars.

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 Storm Water 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

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

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

- Cover
- Contain
- Educate
- Reduce/Minimize

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	
Bacteria	✓
Oil and Grease	
Organics	

Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and stormwater that may contain certain pollutants. The protocols in this fact sheet are intended to reduce pollutants reaching receiving waters through proper conveyance system operation and maintenance.

Approach

Pollution Prevention

Maintain catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis to remove pollutants, reduce high pollutant concentrations during the first flush of storms, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Suggested Protocols

Catch Basins/Inlet Structures

- Staff should regularly inspect facilities to ensure compliance with the following:

  - Immediate repair of any deterioration threatening structural integrity.

  - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.

  - Stenciling of catch basins and inlets (see SC34 Waste Handling and Disposal).

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- Clean catch basins, storm drain inlets, and other conveyance structures before the wet season to remove sediments and debris accumulated during the summer.

- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.

- Keep accurate logs of the number of catch basins cleaned.

- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.

- Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed. Do not dewater near a storm drain or stream.

Storm Drain Conveyance System

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.

- Collect and pump flushed effluent to the sanitary sewer for treatment whenever possible.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.

- Do not allow discharge to reach the storm drain system when cleaning a storm drain pump station or other facility.

- Conduct routine maintenance at each pump station.

- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.

Open Channel

- Modify storm channel characteristics to improve channel hydraulics, increase pollutant removals, and enhance channel/creek aesthetic and habitat value.

- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a Steam or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies (SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS.

Illicit Connections and Discharges

- Look for evidence of illegal discharges or illicit connections during routine maintenance of conveyance system and drainage structures:

  - Is there evidence of spills such as paints, discoloring, etc?

- Are there any odors associated with the drainage system?

- Record locations of apparent illegal discharges/illicit connections?

- Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of upgradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.

- Eliminate the discharge once the origin of flow is established.

■ Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as “Dump No Waste Drains to Stream” stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.

■ Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

■ Inspect and clean up hot spots and other storm drainage areas regularly where illegal dumping and disposal occurs.

■ Establish a system for tracking incidents. The system should be designed to identify the following:

- Illegal dumping hot spots

- 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

■ Post “No Dumping” signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.

■ Refer to fact sheet SC-10 Non-Stormwater Discharges.

Training

■ Train crews in proper maintenance activities, including record keeping and disposal.

■ Allow only properly trained individuals to handle hazardous materials/wastes.

■ Have staff involved in detection and removal of illicit connections trained in the following:

- OSHA-required Health and Safety Training (29 CFR 1910.120) plus annual refresher training (as needed).

- OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and Federal OSHA 29 CFR 1910.146).

- Procedural training (field screening, sampling, smoke/dye testing, TV inspection).

Spill Response and Prevention

- Investigate all reports of spills, leaks, and/or illegal dumping promptly.

- Clean up all spills and leaks using "dry" methods (with absorbent materials and/or rags) or dig up, remove, and properly dispose of contaminated soil.

- Refer to fact sheet SC-11 Spill Prevention, Control, and Cleanup.

Other Considerations (Limitations and Regulations)

- Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.

- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and prohibition against disposal of flushed effluent to sanitary sewer in some areas.

- Regulations may include adoption of substantial penalties for illegal dumping and disposal.

- Local municipal codes may include sections prohibiting discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.

Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget.

- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The primary cost is for staff time. Cost depends on how aggressively a program is implemented. Other cost considerations for an illegal dumping program include:

  - Purchase and installation of signs.

  - Rental of vehicle(s) to haul illegally-disposed items and material to landfills.

  - Rental of heavy equipment to remove larger items (e.g., car bodies) from channels.

  - Purchase of landfill space to dispose of illegally-dumped items and material.

- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.
- Teams of at least two people plus administrative personnel are required to identify illicit discharges, depending on the complexity of the storm sewer system.
- Arrangements must be made for proper disposal of collected wastes.
- Technical staff are required to detect and investigate illegal dumping violations.

Supplemental Information

Further Detail of the BMP

Storm Drain Flushing

Flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in storm drainage systems. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as an open channel, another point where flushing will be initiated, or the sanitary sewer and the treatment facilities, thus preventing resuspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. Deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, thereby releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce impacts of stormwater pollution, a second inflatable device placed well downstream may be used to recollect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to recollect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75% for organics and 55-65% for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm sewer flushing.

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

Ferguson, B.K. 1991. Urban Stream Reclamation, p. 324-322, Journal of Soil and Water Conservation.

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

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

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Storm Drain System Cleaning. On line:
http://www.epa.gov/npdes/menuofbmps/poll_16.htm

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Description

Streets, roads, and highways are significant sources of pollutants in stormwater discharges, and operation and maintenance (O&M) practices, if not conducted properly, can contribute to the problem. Stormwater pollution from roadway and bridge maintenance should be addressed on a site-specific basis. Use of the procedures outlined below, that address street sweeping and repair, bridge and structure maintenance, and unpaved roads will reduce pollutants in stormwater.

Approach

Pollution Prevention

- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal)
- Recycle paint and other materials whenever possible.
- Enlist the help of citizens to keep yard waste, used oil, and other wastes out of the gutter.

Suggested Protocols

Street Sweeping and Cleaning

- Maintain a consistent sweeping schedule. Provide minimum monthly sweeping of curbed streets.
- Perform street cleaning during dry weather if possible.

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- Avoid wet cleaning or flushing of street, and utilize dry methods where possible.
- Consider increasing sweeping frequency based on factors such as traffic volume, land use, field observations of sediment and trash accumulation, proximity to water courses, etc. For example:
  - Increase the sweeping frequency for streets with high pollutant loadings, especially in high traffic and industrial areas.
  - Increase the sweeping frequency just before the wet season to remove sediments accumulated during the summer.
  - Increase the sweeping frequency for streets in special problem areas such as special events, high litter or erosion zones.
- Maintain cleaning equipment in good working condition and purchase replacement equipment as needed. Old sweepers should be replaced with new technologically advanced sweepers (preferably regenerative air sweepers) that maximize pollutant removal.
- Operate sweepers at manufacturer requested optimal speed levels to increase effectiveness.
- To increase sweeping effectiveness consider the following:
  - Institute a parking policy to restrict parking in problematic areas during periods of street sweeping.
  - Post permanent street sweeping signs in problematic areas; use temporary signs if installation of permanent signs is not possible.
  - Develop and distribute flyers notifying residents of street sweeping schedules.
- Regularly inspect vehicles and equipment for leaks, and repair immediately.
- If available use vacuum or regenerative air sweepers in the high sediment and trash areas (typically industrial/commercial).
- Keep accurate logs of the number of curb-miles swept and the amount of waste collected.
- Dispose of street sweeping debris and dirt at a landfill.
- Do not store swept material along the side of the street or near a storm drain inlet.
- Keep debris storage to a minimum during the wet season or make sure debris piles are contained (e.g. by berming the area) or covered (e.g. with tarps or permanent covers).

Street Repair and Maintenance

Pavement marking

- Schedule pavement marking activities for dry weather.

- Develop paint handling procedures for proper use, storage, and disposal of paints.
- Transfer and load paint and hot thermoplastic away from storm drain inlets.
- Provide drop cloths and drip pans in paint mixing areas.
- Properly maintain application equipment.
- Street sweep thermoplastic grindings. Yellow thermoplastic grindings may require special handling as they may contain lead.
- Paints containing lead or tributyltin are considered a hazardous waste and must be disposed of properly.
- Use water based paints whenever possible. If using water based paints, clean the application equipment in a sink that is connected to the sanitary sewer.
- Properly store leftover paints if they are to be kept for the next job, or dispose of properly.

Concrete installation and repair

- Schedule asphalt and concrete activities for dry weather.
- Take measures to protect any nearby storm drain inlets and adjacent watercourses, prior to breaking up asphalt or concrete (e.g. place san bags around inlets or work areas).
- Limit the amount of fresh concrete or cement mortar mixed, mix only what is needed for the job.
- Store concrete materials under cover, away from drainage areas. Secure bags of cement after they are open. Be sure to keep wind-blown cement powder away from streets, gutters, storm drains, rainfall, and runoff.
- Return leftover materials to the transit mixer. Dispose of small amounts of hardened excess concrete, grout, and mortar in the trash.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile, or dispose in the trash.
- When making saw cuts in pavement, use as little water as possible and perform during dry weather. Cover each storm drain inlet completely with filter fabric or plastic during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains or evaporates, shovel or vacuum the slurry residue from the pavement or gutter and remove from site. Alternatively, a small onsite vacuum may be used to pick up the slurry as this will prohibit slurry from reaching storm drain inlets.
- Wash concrete trucks off site or in designated areas on site designed to preclude discharge of wash water to drainage system.

Patching, resurfacing, and surface sealing

- Schedule patching, resurfacing and surface sealing for dry weather.
- Stockpile materials away from streets, gutter areas, storm drain inlets or watercourses. During wet weather, cover stockpiles with plastic tarps or berm around them if necessary to prevent transport of materials in runoff.
- Pre-heat, transfer or load hot bituminous material away from drainage systems or watercourses.
- Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and maintenance holes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and until all water from emulsified oil sealants has drained or evaporated. Clean any debris from covered maintenance holes and storm drain inlets when the job is complete.
- Prevent excess material from exposed aggregate concrete or similar treatments from entering streets or storm drain inlets. Designate an area for clean up and proper disposal of excess materials.
- Use only as much water as necessary for dust control, to avoid runoff.
- Sweep, never hose down streets to clean up tracked dirt. Use a street sweeper or vacuum truck. Do not dump vacuumed liquid in storm drains.
- 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.

Equipment cleaning maintenance and storage

- Inspect equipment daily and repair any leaks. Place drip pans or absorbent materials under heavy equipment when not in use.
- Perform major equipment repairs at the corporation yard, when practical.
- If refueling or repairing vehicles and equipment must be done onsite, use a location away from storm drain inlets and watercourses.
- Clean equipment including sprayers, sprayer paint supply lines, patch and paving equipment, and mud jacking equipment at the end of each day. Clean in a sink or other area (e.g. vehicle wash area) that is connected to the sanitary sewer.

Bridge and Structure Maintenance

Paint and Paint Removal

- Transport paint and materials to and from job sites in containers with secure lids and tied down to the transport vehicle.
- Do not transfer or load paint near storm drain inlets or watercourses.

- Test and inspect spray equipment prior to starting to paint. Tighten all hoses and connections and do not overfill paint container.

- Plug nearby storm drain inlets prior to starting painting where there is significant risk of a spill reaching storm drains. Remove plugs when job is completed.

- If sand blasting is used to remove paint, cover nearby storm drain inlets prior to starting work.

- Perform work on a maintenance traveler or platform, or use suspended netting or tarps to capture paint, rust, paint removing agents, or other materials, to prevent discharge of materials to surface waters if the bridge crosses a watercourse. If sanding, use a sander with a vacuum filter bag.

- Capture all clean-up water, and dispose of properly.

- Recycle paint when possible (e.g. paint may be used for graffiti removal activities). Dispose of unused paint at an appropriate household hazardous waste facility.

Graffiti Removal

- Schedule graffiti removal activities for dry weather.

- Protect nearby storm drain inlets prior to removing graffiti from walls, signs, sidewalks, or other structures needing graffiti abatement. Clean up afterwards by sweeping or vacuuming thoroughly, and/or by using absorbent and properly disposing of the absorbent.

- When graffiti is removed by painting over, implement the procedures under Painting and Paint Removal above.

- Direct runoff from sand blasting and high pressure washing (with no cleaning agents) into a landscaped or dirt area. If such an area is not available, filter runoff through an appropriate filtering device (e.g. filter fabric) to keep sand, particles, and debris out of storm drains.

- If a graffiti abatement method generates wash water containing a cleaning compound (such as high pressure washing with a cleaning compound), plug nearby storm drains and vacuum/pump wash water to the sanitary sewer.

- Consider using a waterless and non-toxic chemical cleaning method for graffiti removal (e.g. gels or spray compounds).

Repair Work

- Prevent concrete, steel, wood, metal parts, tools, or other work materials from entering storm drains or watercourses.

- Thoroughly clean up the job site when the repair work is completed.

- When cleaning guardrails or fences follow the appropriate surface cleaning methods (depending on the type of surface) outlined in SC-71 Plaza & Sidewalk Cleaning fact sheet.

- If painting is conducted, follow the painting and paint removal procedures above.
- If graffiti removal is conducted, follow the graffiti removal procedures above.
- If construction takes place, see the Construction Activity BMP Handbook.
- Recycle materials whenever possible.

Unpaved Roads and Trails

- Stabilize exposed soil areas to prevent soil from eroding during rain events. This is particularly important on steep slopes.
- For roadside areas with exposed soils, the most cost-effective choice is to vegetate the area, preferably with a mulch or binder that will hold the soils in place while the vegetation is establishing. Native vegetation should be used if possible.
- If vegetation cannot be established immediately, apply temporary erosion control mats/blankets; a comma straw, or gravel as appropriate.
- If sediment is already eroded and mobilized in roadside areas, temporary controls should be installed. These may include: sediment control fences, fabric-covered triangular dikes, gravel-filled burlap bags, biobags, or hay bales staked in place.

Non-Stormwater Discharges

Field crews should be aware of non-stormwater discharges as part of their ongoing street maintenance efforts.

- Refer to SC-10 Non-Stormwater Discharges
- Identify location, time and estimated quantity of discharges.
- Notify appropriate personnel.

Training

- Train employees regarding proper street sweeping operation and street repair and maintenance.
- Instruct employees and subcontractors to ensure that measures to reduce the stormwater impacts of roadway/bridge maintenance are being followed.
- Require engineering staff and/or consulting A/E firms to address stormwater quality in new bridge designs or existing bridge retrofits.
- Use a training log or similar method to document training.
- Train employees on proper spill containment and clean up, and in identifying non-stormwater discharges.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Densely populated areas or heavily used streets may require parking regulations to clear streets for cleaning.
- No currently available conventional sweeper is effective at removing oil and grease. Mechanical sweepers are not effective at removing finer sediments.
- Limitations may arise in the location of new bridges. The availability and cost of land and other economic and political factors may dictate where the placement of a new bridge will occur. Better design of the bridge to control runoff is required if it is being placed near sensitive waters.

Requirements

Costs

- The maintenance of local roads and bridges is already a consideration of most community public works or transportation departments. Therefore, the cost of pollutant reducing management practices will involve the training and equipment required to implement these new practices.
- The largest expenditures for street sweeping programs are in staffing and equipment. The capital cost for a conventional street sweeper is between $60,000 and $120,000. Newer technologies might have prices approaching $180,000. The average useful life of a conventional sweeper is about four years, and programs must budget for equipment replacement. Sweeping frequencies will determine equipment life, so programs that sweep more often should expect to have a higher cost of replacement.
- A street sweeping program may require the following.
  - Sweeper operators, maintenance, supervisory, and administrative personnel are required.
  - Traffic control officers may be required to enforce parking restrictions.
  - Skillful design of cleaning routes is required for program to be productive.
  - Arrangements must be made for disposal of collected wastes.

- If investing in newer technologies, training for operators must be included in operation and maintenance budgets. Costs for public education are small, and mostly deal with the need to obey parking restrictions and litter control. Parking tickets are an effective reminder to obey parking rules, as well as being a source of revenue.

Maintenance
- Not applicable

Supplemental Information
Further Detail of the BMP
Street sweeping

There are advantages and disadvantages to the two common types of sweepers. The best choice depends on your specific conditions. Many communities find it useful to have a compliment of both types in their fleet.

Mechanical Broom Sweepers - More effective at picking up large debris and cleaning wet streets. Less costly to purchase and operate. Create more airborne dust.

Vacuum Sweepers - More effective at removing fine particles and associated heavy metals. Ineffective at cleaning wet streets. Noisier than mechanical broom sweepers which may restrict areas or times of operation. May require an advance vehicle to remove large debris.

Street Flushers - Not affected by biggest interference to cleaning, parked cars. May remove finer sediments, moving them toward the gutter and stormwater inlets. For this reason, flushing fell out of favor and is now used primarily after sweeping. Flushing may be effective for combined sewer systems. Presently street flushing is not allowed under most NPDES permits.

Cross-Media Transfer of Pollutants

The California Air Resources Board (ARB) has established state ambient air quality standards including a standard for respirable particulate matter (less than or equal to 10 microns in diameter, symbolized as PM10). In the effort to sweep up finer sediments to remove attached heavy metals, municipalities should be aware that fine dust, that cannot be captured by the sweeping equipment and becomes airborne, could lead to issues of worker and public safety.

Bridges

Bridges that carry vehicular traffic generate some of the more direct discharges of runoff to surface waters. Bridge scupper drains cause a direct discharge of stormwater into receiving waters and have been shown to carry relatively high concentrations of pollutants. Bridge maintenance also generates wastes that may be either directly deposited to the water below or carried to the receiving water by stormwater. The following steps will help reduce the stormwater impacts of bridge maintenance:

- Site new bridges so that significant adverse impacts to wetlands, sensitive areas, critical habitat, and riparian vegetation are minimized.

- Design new bridges to avoid the use of scupper drains and route runoff to land for treatment control. Existing scupper drains should be cleaned on a regular basis to avoid sediment/debris accumulation.

- Reduce the discharge of pollutants to surface waters during maintenance by using suspended traps, vacuums, or booms in the water to capture paint, rust, and paint removing agents. Many of these wastes may be hazardous. Properly dispose of this waste by referring to CA21 (Hazardous Waste Management) in the Construction Handbook.

- Train employees and subcontractors to reduce the discharge of wastes during bridge maintenance.

De-icing

- Do not over-apply deicing salt and sand, and routinely calibrate spreaders.

- Near reservoirs, restrict the application of deicing salt and redirect any runoff away from reservoirs.

- Consider using alternative deicing agents (less toxic, biodegradable, etc.).

References and Resources

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

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

Santa Clara Valley Urban Runoff Pollution Prevention Program. 2001. Fresh Concrete and Mortar Application Best Management Practices for the Construction Industry. June.

Santa Clara Valley Urban Runoff Pollution Prevention Program. 2001. Roadwork and Paving Best Management Practices for the Construction Industry. June.

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Roadway and Bridge Maintenance. On-line http://www.epa.gov/npdes/menuofbmps/poll_13.htm

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- ☑ Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

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Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.

- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.

- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.

- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.

- Promote natural vegetation by using parking lot islands and other landscaped areas.

- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.

- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

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.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

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.

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.

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- 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.

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING

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– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

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. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

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.

- 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.

Outdoor Material Storage Areas SD-34

Design Objectives

Maximize Infiltration

Provide Retention

Slow Runoff

Minimize Impervious Land Coverage

Prohibit Dumping of Improper Materials

✓ Contain Pollutant

Collect and Convey

Description
Proper design of outdoor storage areas for materials reduces opportunity for toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to enter the stormwater conveyance system. Materials may be in the form of raw products, by-products, finished products, and waste products. The type of pollutants associated with the materials will vary depending on the type of commercial or industrial activity.

Approach
Outdoor storage areas require a drainage approach different from the typical infiltration/detention strategy. In outdoor storage areas, infiltration is discouraged. Containment is encouraged. Preventative measures include enclosures, secondary containment structures and impervious surfaces.

Suitable Applications
Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations
Some materials are more of a concern than others. Toxic and hazardous materials must be prevented from coming in contact with stormwater. Non-toxic or non-hazardous materials do not have to be prevented from stormwater contact. However, these materials may have toxic effects on receiving waters if allowed to be discharged with stormwater in significant quantities. Accumulated material on an impervious surface could result in significant impact on the rivers or streams that receive the runoff.

Material may be stored in a variety of ways, including bulk piles, containers, shelving, stacking, and tanks. Stormwater contamination may be prevented by eliminating the possibility of stormwater contact with the material storage areas either through diversion, cover, or capture of the stormwater. Control measures may also include minimizing the storage area. Design requirements

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for material storage areas are governed by Building and Fire Codes, and by current City or County ordinances and zoning requirements. Control measures are site specific, and must meet local agency requirements.

Designing New Installations

Where proposed project plans include outdoor areas for storage of materials that may contribute pollutants to the stormwater conveyance system, the following structural or treatment BMPS should be considered:

- Materials with the potential to contaminate stormwater should be: (1) placed in an enclosure such as, but not limited to, a cabinet, shed, or similar structure that prevents contact with runoff or spillage to the stormwater conveyance system, or (2) protected by secondary containment structures such as berms, dikes, or curbs.

- The storage area should be paved and sufficiently impervious to contain leaks and spills.

- The storage area should slope towards a dead-end sump to contain spills and direct runoff from downspouts/roofs should be directed away from storage areas.

- The storage area should have a roof or awning that extends beyond the storage area to minimize collection of stormwater within the secondary containment area. A manufactured storage shed may be used for small containers.

Note that the location(s) of installations of where these preventative measures will be employed must be included on the map or plans identifying BMPs.

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

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permits.

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.

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Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Appendix F: Operation and Maintenance Materials

StormTech®

Detention • Retention • Water Quality

An ADS company

Isolator® Row O&M Manual


SC-740


MC-3500


MC-4500

THE MOST **ADVANCED** NAME IN WATER MANAGEMENT SOLUTIONS™

THE ISOLATOR® ROW

INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance.

THE ISOLATOR ROW

The Isolator Row is a row of StormTech chambers, either SC-160LP, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-4500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC- 310-3 and SC-740 models) allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber. The non-woven fabric is not required over the SC-160LP, DC-780, MC-3500 or MC-4500 models as these chambers do not have perforated side walls.

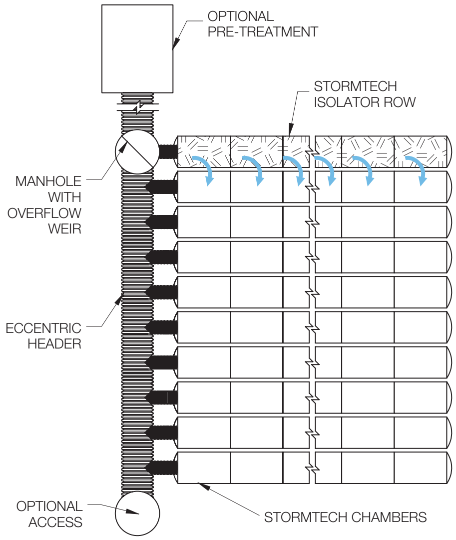
The Isolator Row is typically designed to capture the “first flush” and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating storm water prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured. Pre-treatment best management practices can be as simple as deep sump catch basins, oil-water separators or can be innovative storm water treatment devices. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.

Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.

StormTech Isolator Row with Overflow Spillway (not to scale)



ISOLATOR ROW INSPECTION/MAINTENANCE

INSPECTION

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

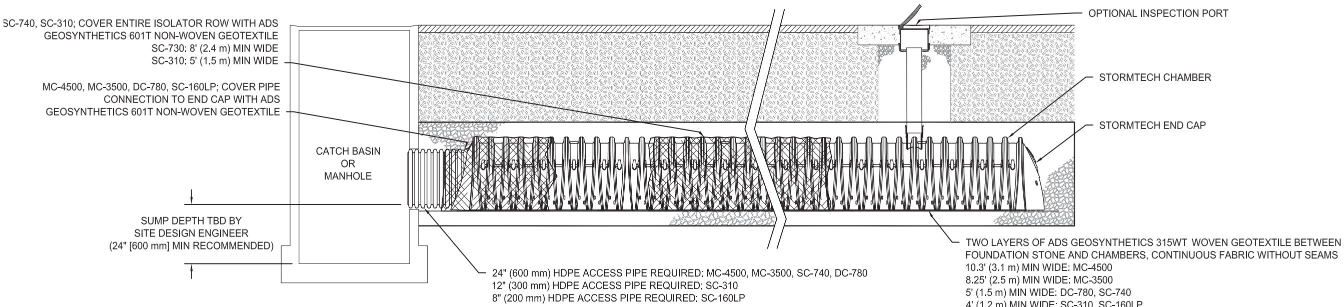
MAINTENANCE

The Isolator Row was designed to reduce the cost of periodic maintenance. By “isolating” sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45” are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row (not to scale)

Note: Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-4500 chamber models and is not required over the entire Isolator Row.



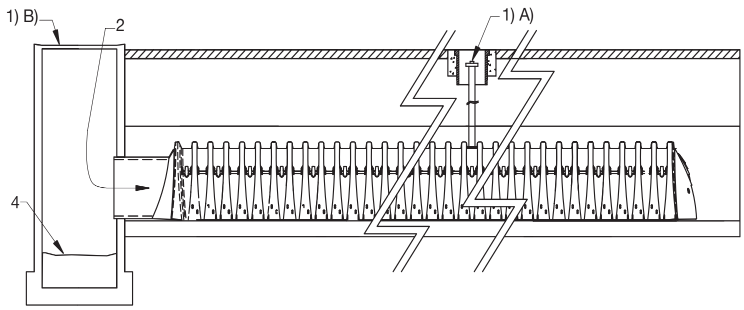
ISOLATOR ROW STEP BY STEP MAINTENANCE PROCEDURES

STEP 1
Inspect Isolator Row for sediment.
A) Inspection ports (if present)
  i. Remove lid from floor box frame
  ii. Remove cap from inspection riser
  iii. Using a flashlight and stadia rod,measure depth of sediment and record results on maintenance log.
  iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.
B) All Isolator Rows
  i. Remove cover from manhole at upstream end of Isolator Row
  ii. Using a flashlight, inspect down Isolator Row through outlet pipe
    1. Mirrors on poles or cameras may be used to avoid a confined space entry
    2. Follow OSHA regulations for confined space entry if entering manhole
  iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2. If not, proceed to Step 3.

STEP 2
Clean out Isolator Row using the JetVac process.
A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
B) Apply multiple passes of JetVac until backflush water is clean
C) Vacuum manhole sump as required

STEP 3
Replace all caps, lids and covers, record observations and actions.

STEP 4
Inspect & clean catch basins and manholes upstream of the StormTech system.



SAMPLE MAINTENANCE LOG

Date	Stadia Rod Readings: Fixed point to chamber bottom (1)	Stadia Rod Readings: Fixed point to top of sediment (2)	Sediment Depth (1)–(2)	Observations/Actions	Inspector
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

StormTech® Detention • Retention • Water Quality
A division of ADS

Advanced Drainage Systems, Inc.
4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

Appendix G – Greenhouse Gas Assessment

Greenhouse Gas Emissions Assessment
Victorville Nisqualli Project
City of Victorville, California

Prepared by:

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714.939.1030

September 2021

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LIST OF ABBREVIATED TERMS

AB	Assembly Bill
CARB	California Air Resource Board
CCR	California Code of Regulations
CalEEMod	California Emissions Estimator Model
CEQA	California Environmental Quality Act
CALGreen Code	California Green Building Standards Code
CPUC	California Public Utilities Commission
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CFC	Chlorofluorocarbon
CPP	Clean Power Plan
CCSP	Climate Change Scoping Plan
cy	cubic yard
EPA	Environmental Protection Agency
FCAA	Federal Clean Air Act
FR	Federal Register
GHG	greenhouse gas
HCFC	Hydrochlorofluorocarbon
HFC	Hydrofluorocarbon
LCFS	Low Carbon Fuel Standard
CH_4	Methane
$MMTCO_2e$	million metric tons of carbon dioxide equivalent
$MTCO_2e$	million tons of carbon dioxide equivalent
NHTSA	National Highway Traffic Safety Administration
NF_3	nitrogen trifluoride
N_2O	nitrous oxide
PFC	Perfluorocarbon
RTP/SCS	Regional Transportation Plan/Sustainable Communities Strategy
SB	Senate Bill
SCAB	South Coast Air Basin
SCAQMD	South Coast Air Quality Management District
SCAG	Southern California Association of Government
Sf	square foot
SF_6	sulfur hexafluoride
TAC	toxic air contaminants

1 INTRODUCTION

This report documents the results of a Greenhouse Gas (GHG) Emissions Assessment completed for the Victorville Nisqualli project (Project). The purpose of this GHG Emissions Assessment is to evaluate the potential construction and operational emissions associated with the Project and determine the level of impact the Project would have on the environment.

1.1 Project Location

The proposed Project site is located at the northwest corner of Nisqualli Road and Mariposa Road in the City of Victorville, County of San Bernardino, California. The assessor's parcel numbers (APNs) for the Project site are 3092-311-09 and -10. The Project site is located east of Interstate 15 (I-15), north of Nisqualli Road, and west of Mariposa Road. The Project site is bounded by vacant land to the north, Victorville School District to the south, Victor Valley Christian School & First Assembly of God Church to the east, and I-15 to the west; refer to **Exhibit 1: Regional Location Map** and **Exhibit 2: Project Vicinity Map.**

1.2 Project Description

The Project site is an undeveloped, fully pervious, and vegetated with annual grasses and weeds. The site is 6.03-acres or 262,231 square feet (SF) composed of two APNs. The proposed Project is a standalone development consisting of a new Maverik 9,084-square-foot building containing a convenience/quick service restaurant (QSR) and a QSR with drive thru. The convenience store/QSR without drive thru would be located on western portion of the proposed building. The QSR with drive thru would be located on the eastern portion of the proposed building. The drive thru ingress would begin between the western property line and the west side of the proposed building. The drive thru lane would wrap around the back of the building with an approximate capacity of fourteen vehicles in the queue. The drive thru egress would terminate at the point of sale (POS) located along the eastern portion of the proposed building.

Additionally, the Project would include a fuel station for passenger cars and trucks with accompanying fuel islands and canopies, underground fuel storage tanks, associated fueling appurtenances, recreational vehicle (RV) dump, air compressor, a truck scale, landscaping, concrete, hardscape, and asphalt paving. The associated improvements include, but are not limited to onsite and offsite grading, domestic water service, sanitary sewer service, storm drain infrastructure, street improvements, concrete and asphalt pavement, landscaping, and irrigation. The truck scale would be installed along the northwest property line and the RV dump along the eastern property line, just north of the main entrance; refer to **Exhibit 3: Site Plan.**

The fuel island canopies would be supported by steel frames and columns extending to the foundation system. Twelve fueling islands would be provided. The parking/drive paved areas would utilize both asphalt and concrete pavement. Concrete pavement would be installed in front of the proposed store structure, as well as in the canopy fuel islands and over the underground storage tank area. In other areas, asphalt concrete sections would be used. Traffic is projected to consist mostly of automobiles and light trucks.

Daily routine site activities would consist of customers entering the site to fuel their automobiles or trucks and entering the convenience store for food/snacks or utilizing the proposed drive thru. A covered trash enclosure would be provided along the western property line at the level of the main entrance.

The Project site is designated under the General Plan Land Use Map as (COM) Commercial with a zoning district of (C-2T) General Commercial.

Site Access and Parking

Main ingress and egress to the site is provided via one full-movement driveway (North Driveway) on the eastern property line along Mariposa Road, approximately 350 feet north of Nisqualli Road. A second driveway (South Driveway) is provided on the northeast corner of the site. Pedestrian and ADA access to the Project site is provided on Mariposa Road via a pedestrian designated path of travel traversing the site horizontally and another path of travel on the southwest corner of the site; refer to **Exhibit 3**.

The Project is required to provide a minimum of 32 parking spaces. The Project would provide 42 standard parking spaces inclusive of 2 ADA parking spaces. As shown on **Exhibit 3**, passenger vehicle parking is provided along south west, south, and southeast portions of the site, adjacent to the convenience store and QSR.

Construction

The proposed Project is anticipated to be constructed in one phase. Construction is anticipated to begin in January 2022 with completion of January 2023. The soil cut is anticipated at 15,730 CY, with approximately 1,383 CY of fill and a net of 14,347 CY.

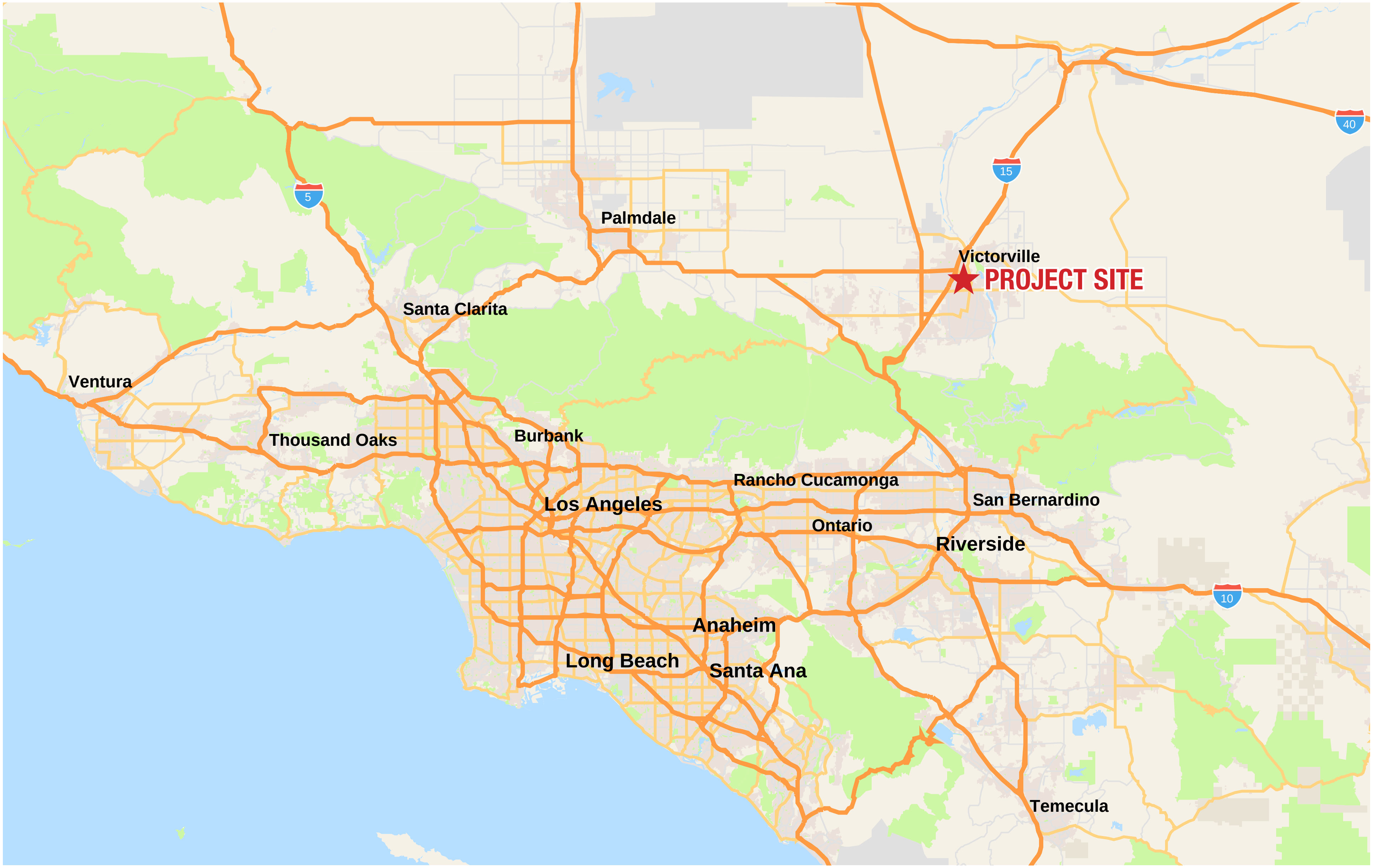

EXHIBIT 1: Regional Location Map

Victorville Nisqualli Gas Station Project

City of Victorville

Not to Scale

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EXHIBIT 2: Project Vicinity Map
Victorville Nisqualli Gas Station Project
City of Victorville

N Not to Scale

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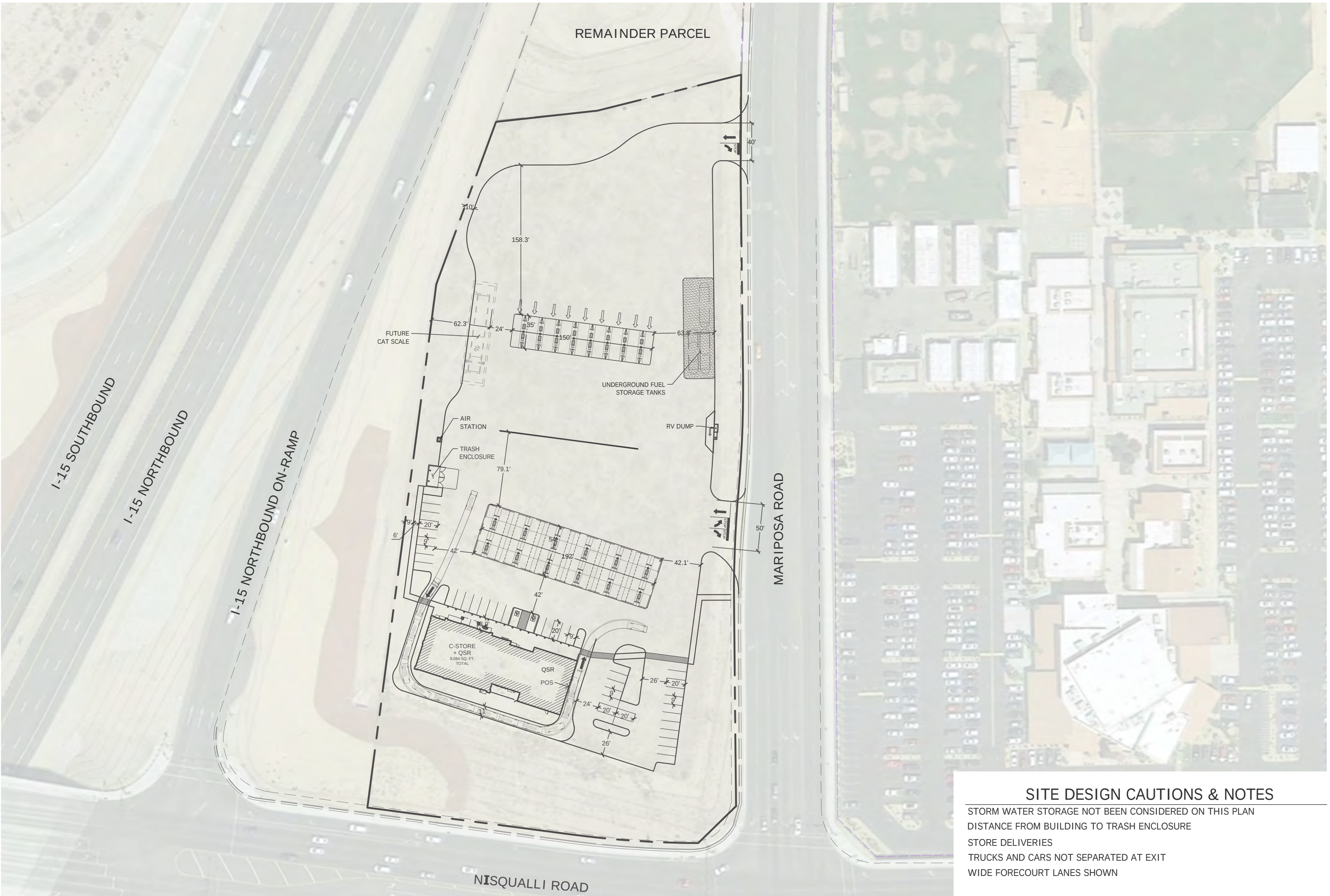

SITE DESIGN CAUTIONS & NOTES

STORM WATER STORAGE NOT BEEN CONSIDERED ON THIS PLAN
DISTANCE FROM BUILDING TO TRASH ENCLOSURE
STORE DELIVERIES
TRUCKS AND CARS NOT SEPARATED AT EXIT
WIDE FORECOURT LANES SHOWN

EXHIBIT 3: Conceptual Site Plan

Victorville Nisqualli Gas Station Project

City of Victorville

Not to Scale

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2 ENVIRONMENTAL SETTING

2.1 Greenhouse Gases and Climate Change

Certain gases in the earth's atmosphere classified as GHGs, play a critical role in determining the earth's surface temperature. Solar radiation enters the earth's atmosphere from space. A portion of the radiation is absorbed by the earth's surface and a smaller portion of this radiation is reflected back toward space. This absorbed radiation is then emitted from the earth as low-frequency infrared radiation. The frequencies at which bodies emit radiation are proportional to temperature. Because the earth has a much lower temperature than the sun, it emits lower-frequency radiation. Most solar radiation passes through GHGs; however, infrared radiation is absorbed by these gases. As a result, radiation that otherwise would have escaped back into space is instead "trapped," resulting in a warming of the atmosphere. This phenomenon, known as the greenhouse effect, is responsible for maintaining a habitable climate on earth.

The primary GHGs contributing to the greenhouse effect are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Fluorinated gases also make up a small fraction of the GHGs that contribute to climate change. Examples of fluorinated gases include chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3); however, it is noted that these gases are not associated with typical land use development. Human-caused emissions of GHGs exceeding natural ambient concentrations are believed to be responsible for intensifying the greenhouse effect and leading to a trend of unnatural warming of the Earth's climate, known as global climate change or global warming.

GHGs are global pollutants, unlike criteria air pollutants and toxic air contaminants (TACs), which are pollutants of regional and local concern. Whereas pollutants with localized air quality effects have relatively short atmospheric lifetimes (about one day), GHGs have long atmospheric lifetimes (one to several thousand years). GHGs persist in the atmosphere for long enough time periods to be dispersed around the globe. Although the exact lifetime of a GHG molecule is dependent on multiple variables and cannot be pinpointed, more CO_2 is emitted into the atmosphere than is sequestered by ocean uptake, vegetation, or other forms of carbon sequestration. Of the total annual human-caused CO_2 emissions, approximately 55 percent is sequestered through ocean and land uptakes every year, averaged over the last 50 years, whereas the remaining 45 percent of human-caused CO_2 emissions remains stored in the atmosphere[1]. **Table 1: Description of Greenhouse Gases** describes the primary GHGs attributed to global climate change, including their physical properties.

[1] Intergovernmental Panel on Climate Change, *Carbon and Other Biogeochemical Cycles. In: Climate Change 2013: The Physical Science Basis*, *Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, 2013. http://www.climatechange2013.org/ images/report/WG1AR5_ALL_FINAL.pdf.

Table 1: Description of Greenhouse Gases

Greenhouse Gas	Description
Carbon Dioxide (CO_2)	CO_2 is a colorless, odorless gas that is emitted naturally and through human activities. Natural sources include decomposition of dead organic matter; respiration of bacteria, plants, animals, and fungus; evaporation from oceans; and volcanic outgassing. Anthropogenic sources are from burning coal, oil, natural gas, and wood. The largest source of CO_2 emissions globally is the combustion of fossil fuels such as coal, oil, and gas in power plants, automobiles, and industrial facilities. The atmospheric lifetime of CO_2 is variable because it is readily exchanged in the atmosphere. CO_2 is the most widely emitted GHG and is the reference gas (Global Warming Potential of 1) for determining Global Warming Potentials for other GHGs.
Nitrous Oxide (N_2O)	N_2O is largely attributable to agricultural practices and soil management. Primary human-related sources of N_2O include agricultural soil management, sewage treatment, combustion of fossil fuels, and adipic and nitric acid production. N_2O is produced from biological sources in soil and water, particularly microbial action in wet tropical forests. The atmospheric lifetime of N_2O is approximately 120 years. The Global Warming Potential of N_2O is 298.
Methane (CH_4)	CH_4, a highly potent GHG, primarily results from off-gassing (the release of chemicals from nonmetallic substances under ambient or greater pressure conditions) and is largely associated with agricultural practices and landfills. Methane is the major component of natural gas, about 87 percent by volume. Human-related sources include fossil fuel production, animal husbandry, rice cultivation, biomass burning, and waste management. Natural sources of CH_4 include wetlands, gas hydrates, termites, oceans, freshwater bodies, non-wetland soils, and wildfires. The atmospheric lifetime of CH_4 is about 12 years and the Global Warming Potential is 25.
Hydrofluorocarbons (HFCs)	HFCs are typically used as refrigerants for both stationary refrigeration and mobile air conditioning. The use of HFCs for cooling and foam blowing is increasing, as the continued phase out of CFCs and HCFCs gains momentum. The 100-year Global Warming Potential of HFCs range from 124 for HFC-152 to 14,800 for HFC-23.
Perfluorocarbons (PFCs)	PFCs have stable molecular structures and only break down by ultraviolet rays about 60 kilometers above Earth's surface. Because of this, they have long lifetimes, between 10,000 and 50,000 years. Two main sources of PFCs are primary aluminum production and semiconductor manufacturing. Global Warming Potentials range from 6,500 to 9,200.
Chlorofluorocarbons (CFCs)	CFCs are gases formed synthetically by replacing all hydrogen atoms in methane or ethane with chlorine and/or fluorine atoms. They are nontoxic, nonflammable, insoluble, and chemically unreactive in the troposphere (the level of air at the earth's surface). CFCs were synthesized in 1928 for use as refrigerants, aerosol propellants, and cleaning solvents. The Montreal Protocol on Substances that Deplete the Ozone Layer prohibited their production in 1987. Global Warming Potentials for CFCs range from 3,800 to 14,400.
Sulfur Hexafluoride (SF_6)	SF_6 is an inorganic, odorless, colorless, and nontoxic, nonflammable gas. It has a lifetime of 3,200 years. This gas is manmade and used for insulation in electric power transmission equipment, in the magnesium industry, in semiconductor manufacturing, and as a tracer gas. The Global Warming Potential of SF_6 is 23,900.
Hydrochlorofluorocarbons (HCFCs)	HCFCs are solvents, similar in use and chemical composition to CFCs. The main uses of HCFCs are for refrigerant products and air conditioning systems. As part of the Montreal Protocol, HCFCs are subject to a consumption cap and gradual phase out. The United States is scheduled to achieve a 100 percent reduction to the cap by 2030. The 100-year Global Warming Potentials of HCFCs range from 90 for HCFC-123 to 1,800 for HCFC-142b.
Nitrogen Trifluoride (NF_3)	NF_3 was added to Health and Safety Code section 38505(g)(7) as a GHG of concern. This gas is used in electronics manufacture for semiconductors and liquid crystal displays. It has a high global warming potential of 17,200.

Source: Compiled from U.S. EPA, *Overview of Greenhouse Gases*, April 11, 2018 (https://www.epa.gov/ghgemissions/overview-greenhouse-gases); U.S. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016*, 2018; Intergovernmental Panel on Climate Change, *Climate Change 2007: The Physical Science Basis*, 2007; National Research Council, Advancing the Science of Climate Change, 2010; U.S. EPA, *Methane and Nitrous Oxide Emission from Natural Sources*, April 2010.

3 REGULATORY SETTING

3.1 Federal

To date, national standards have not been established for nationwide GHG reduction targets, nor have any regulations or legislation been enacted specifically to address climate change and GHG emissions reduction at the project level. Various efforts have been promulgated at the federal level to improve fuel economy and energy efficiency to address climate change and its associated effects.

Energy Independence and Security Act of 2007

The Energy Independence and Security Act of 2007 (December 2007), among other key measures, requires the following, which would aid in the reduction of national GHG emissions:

- Increase the supply of alternative fuel sources by setting a mandatory Renewable Fuel Standard requiring fuel producers to use at least 36 billion gallons of biofuel in 2022.
- Set a target of 35 miles per gallon for the combined fleet of cars and light trucks by model year 2020 and direct the National Highway Traffic Safety Administration (NHTSA) to establish a fuel economy program for medium- and heavy-duty trucks and create a separate fuel economy standard for work trucks.
- Prescribe or revise standards affecting regional efficiency for heating and cooling products and procedures for new or amended standards, energy conservation, energy efficiency labeling for consumer electronic products, residential boiler efficiency, electric motor efficiency, and home appliances.

U.S. Environmental Protection Agency Endangerment Finding

The U.S. Environmental Protection Agency (EPA) authority to regulate GHG emissions stems from the U.S. Supreme Court decision in *Massachusetts v. EPA* (2007). The Supreme Court ruled that GHGs meet the definition of air pollutants under the existing Federal Clean Air Act (FCAA) and must be regulated if these gases could be reasonably anticipated to endanger public health or welfare. Responding to the Court's ruling, the EPA finalized an endangerment finding in December 2009. Based on scientific evidence it found that six GHGs (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) constitute a threat to public health and welfare. Thus, it is the Supreme Court's interpretation of the existing FCAA and the EPA's assessment of the scientific evidence that form the basis for the EPA's regulatory actions.

Federal Vehicle Standards

In response to the U.S. Supreme Court ruling discussed above, Executive Order 13432 was issued in 2007 directing the EPA, the Department of Transportation, and the Department of Energy to establish regulations that reduce GHG emissions from motor vehicles, non-road vehicles, and non-road engines by 2008. In 2009, the NHTSA issued a final rule regulating fuel efficiency and GHG emissions from cars and light-duty trucks for model year 2011, and in 2010, the EPA and NHTSA issued a final rule regulating cars and light-duty trucks for model years 2012–2016.

In 2010, an Executive Memorandum was issued directing the Department of Transportation, Department of Energy, EPA, and NHTSA to establish additional standards regarding fuel efficiency and GHG reduction, clean fuels, and advanced vehicle infrastructure. In response to this directive, the EPA and NHTSA proposed stringent, coordinated federal GHG and fuel economy standards for model years 2017–2025 light-duty vehicles. The proposed standards projected to achieve 163 grams per mile of CO_2 in model year 2025, on an average industry fleet-wide basis, which is equivalent to 54.5 miles per gallon if this level were achieved solely through fuel efficiency. The final rule was adopted in 2012 for model years 2017–2021, and NHTSA intends to set standards for model years 2022–2025 in a future rulemaking. On January 12, 2017, the EPA finalized its decision to maintain the current GHG emissions standards for model years 2022–2025 cars and light trucks. It should be noted that the U.S. EPA is currently proposing to freeze the vehicle fuel efficiency standards at their planned 2020 level (37 mpg), canceling any future strengthening (currently 54.5 mpg by 2026).

In addition to the regulations applicable to cars and light-duty trucks described above, in 2011, the EPA and NHTSA announced fuel economy and GHG standards for medium- and heavy-duty trucks for model years 2014–2018. The standards for CO_2 emissions and fuel consumption are tailored to three main vehicle categories: combination tractors, heavy-duty pickup trucks and vans, and vocational vehicles. According to the EPA, this regulatory program will reduce GHG emissions and fuel consumption for the affected vehicles by 6 to 23 percent over the 2010 baselines.

In August 2016, the EPA and NHTSA announced the adoption of the phase two program related to the fuel economy and GHG standards for medium- and heavy-duty trucks. The phase two program will apply to vehicles with model year 2018 through 2027 for certain trailers, and model years 2021 through 2027 for semi-trucks, large pickup trucks, vans, and all types and sizes of buses and work trucks. The final standards are expected to lower CO_2 emissions by approximately 1.1 billion metric tons and reduce oil consumption by up to 2 billion barrels over the lifetime of the vehicles sold under the program.

In 2018, the President and the EPA stated their intent to halt various federal regulatory activities to reduce GHG emission, including the phase two program. California and other states have stated their intent to challenge federal actions that would delay or eliminate GHG reduction measures and have committed to cooperating with other countries to implement global climate change initiatives. On September 27, 2019, the EPA and the NHTSA published the "Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule Part One: One National Program." (84 Fed. Reg. 51,310 (Sept. 27, 2019.) The Part One Rule revokes California's authority to set its own GHG emissions standards and set zero-emission vehicle mandates in California. On March 31, 2020, the EPA and NHTSA finalized rulemaking for SAFE Part Two sets CO_2 emissions standards and corporate average fuel economy (CAFE) standards for passenger vehicles and light duty trucks, covering model years 2021-2026.

3.2 State of California

California Air Resources Board

The California Air Resources Board (CARB) is responsible for the coordination and oversight of State and local air pollution control programs in California. Various statewide and local initiatives to reduce California's contribution to GHG emissions have raised awareness about climate change and its potential for severe long-term adverse environmental, social, and economic effects. California is a significant emitter of CO_2 equivalents (CO_2e) in the world and produced 459 million gross metric tons of CO_2e in 2013.

In the State, the transportation sector is the largest emitter of GHGs, followed by industrial operations such as manufacturing and oil and gas extraction.

The State of California legislature has enacted a series of bills that constitute the most aggressive program to reduce GHGs of any state in the nation. Some legislation, such as the landmark Assembly Bill (AB) 32, *California Global Warming Solutions Act of 2006*, was specifically enacted to address GHG emissions. Other legislation, such as Title 24 building efficiency standards and Title 20 appliance energy standards, were originally adopted for other purposes such as energy and water conservation, but also provide GHG reductions. This section describes the major provisions of the legislation.

Assembly Bill 32 (California Global Warming Solutions Act of 2006)

AB 32 instructs the CARB to develop and enforce regulations for the reporting and verification of statewide GHG emissions. AB 32 also directed CARB to set a GHG emissions limit based on 1990 levels, to be achieved by 2020. It set a timeline for adopting a scoping plan for achieving GHG reductions in a technologically and economically feasible manner.

California Air Resource Board Scoping Plan

CARB adopted the Scoping Plan to achieve the goals of AB 32. The Scoping Plan establishes an overall framework for the measures that would be adopted to reduce California's GHG emissions. CARB determined that achieving the 1990 emissions level would require a reduction of GHG emissions of approximately 29 percent below what would otherwise occur in 2020 in the absence of new laws and regulations (referred to as "business-as-usual")[2]. The Scoping Plan evaluates opportunities for sector-specific reductions, integrates early actions and additional GHG reduction measures by both CARB and the State's Climate Action Team, identifies additional measures to be pursued as regulations, and outlines the adopted role of a cap-and-trade program[3]. Additional development of these measures and adoption of the appropriate regulations occurred through the end of 2013. Key elements of the Scoping Plan include:

- Expanding and strengthening existing energy efficiency programs, as well as building and appliance standards.
- Achieving a statewide renewables energy mix of 33 percent by 2020.
- Developing a California cap-and-trade program that links with other programs to create a regional market system and caps sources contributing 85 percent of California's GHG emissions (adopted in 2011).
- Establishing targets for transportation-related GHG emissions for regions throughout California and pursuing policies and incentives to achieve those targets (several sustainable community strategies have been adopted).

---

2 CARB defines business-as-usual (BAU) in its Scoping Plan as emissions levels that would occur if California continued to grow and add new GHG emissions but did not adopt any measures to reduce emissions. Projections for each emission-generating sector were compiled and used to estimate emissions for 2020 based on 2002–2004 emissions intensities. Under CARB's definition of BAU, new growth is assumed to have the same carbon intensities as was typical from 2002 through 2004.

3 The Climate Action Team, led by the secretary of the California Environmental Protection Agency, is a group of State agency secretaries and heads of agencies, boards, and departments. Team members work to coordinate statewide efforts to implement global warming emissions reduction programs and the State's Climate Adaptation Strategy.

- Adopting and implementing measures pursuant to existing State laws and policies, including California's clean car standards, heavy-duty truck measures, the Low Carbon Fuel Standard (amendments to the Pavley Standard adopted 2009; Advanced Clean Car standard adopted 2012), goods movement measures, and the Low Carbon Fuel Standard (adopted 2009).
- Creating targeted fees, including a public goods charge on water use, fees on gasses with high global warming potential, and a fee to fund the administrative costs of the State of California's long-term commitment to AB 32 implementation.

In 2012, CARB released revised estimates of the expected 2020 emissions reductions. The revised analysis relied on emissions projections updated in light of current economic forecasts that accounted for the economic downturn since 2008, reduction measures already approved and put in place relating to future fuel and energy demand, and other factors. This update reduced the projected 2020 emissions from 596 million metric tons of CO_2e ($MMTCO_2e$) to 545 $MMTCO_2e$. The reduction in forecasted 2020 emissions means that the revised business-as-usual reduction necessary to achieve AB 32's goal of reaching 1990 levels by 2020 is now 21.7 percent, down from 29 percent. CARB also provided a lower 2020 inventory forecast that incorporated State-led GHG emissions reduction measures already in place. When this lower forecast is considered, the necessary reduction from business-as-usual needed to achieve the goals of AB 32 is approximately 16 percent.

CARB adopted the first major update to the Scoping Plan on May 22, 2014. The updated Scoping Plan summarizes the most recent science related to climate change, including anticipated impacts to California and the levels of GHG emissions reductions necessary to likely avoid risking irreparable damage. It identifies the actions California has already taken to reduce GHG emissions and focuses on areas where further reductions could be achieved to help meet the 2020 target established by AB 32.

In 2016, the Legislature passed Senate Bill (SB) 32, which codifies a 2030 GHG emissions reduction target of 40 percent below 1990 levels. With SB 32, the Legislature passed companion legislation, AB 197, which provides additional direction for developing the Scoping Plan. On December 14, 2017 CARB adopted a second update to the Scoping Plan[4]. The 2017 Scoping Plan details how the State will reduce GHG emissions to meet the 2030 target set by Executive Order B-30-15 and codified by SB 32. Other objectives listed in the 2017 Scoping plan are to provide direct GHG emissions reductions; support climate investment in disadvantaged communities; and, support the Clean Power Plan and other Federal actions.

Senate Bill 32 (California Global Warming Solutions Act of 2006: Emissions Limit)

Signed into law in September 2016, SB 32 codifies the 2030 GHG reduction target in Executive Order B-30-15 (40 percent below 1990 levels by 2030). The bill authorizes CARB to adopt an interim GHG emissions level target to be achieved by 2030. CARB also must adopt rules and regulations in an open public process to achieve the maximum, technologically feasible, and cost-effective GHG reductions.

SB 375 (The Sustainable Communities and Climate Protection Act of 2008)

Signed into law on September 30, 2008, SB 375 provides a process to coordinate land use planning, regional transportation plans, and funding priorities to help California meet the GHG reduction goals established by AB 32. SB 375 requires metropolitan planning organizations to include sustainable

[4] California Air Resources Board, *California's 2017 Climate Change Scoping Plan,* https://www.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf. Accessed May 9, 2018.

community strategies in their regional transportation plans for reducing GHG emissions, aligns planning for transportation and housing, and creates specified incentives for the implementation of the strategies.

AB 1493 (Pavley Regulations and Fuel Efficiency Standards)

AB 1493, enacted on July 22, 2002, required CARB to develop and adopt regulations that reduce GHGs emitted by passenger vehicles and light duty trucks. Implementation of the regulation was delayed by lawsuits filed by automakers and by the EPA's denial of an implementation waiver. The EPA subsequently granted the requested waiver in 2009, which was upheld by the by the U.S. District Court for the District of Columbia in 2011. The regulations establish one set of emission standards for model years 2009–2016 and a second set of emissions standards for model years 2017 to 2025. By 2025, when all rules will be fully implemented, new automobiles will emit 34 percent fewer CO_2e emissions and 75 percent fewer smog-forming emissions.

SB 1368 (Emission Performance Standards)

SB 1368 is the companion bill of AB 32, which directs the California Public Utilities Commission (CPUC) to adopt a performance standard for GHG emissions for the future power purchases of California utilities. SB 1368 limits carbon emissions associated with electrical energy consumed in California by forbidding procurement arrangements for energy longer than 5 years from resources that exceed the emissions of a relatively clean, combined cycle natural gas power plant. The new law effectively prevents California's utilities from investing in, otherwise financially supporting, or purchasing power from new coal plants located in or out of the State. The CPUC adopted the regulations required by SB 1368 on August 29, 2007. The regulations implementing SB 1368 establish a standard for baseload generation owned by, or under long-term contract to publicly owned utilities, for 1,100 pounds of CO_2 per megawatt-hour.

SB 1078 and SBX1-2 (Renewable Electricity Standards)

SB 1078 requires California to generate 20 percent of its electricity from renewable energy by 2017. SB 107 changed the due date to 2010 instead of 2017. On November 17, 2008, Governor Arnold Schwarzenegger signed Executive Order S-14-08, which established a Renewable Portfolio Standard target for California requiring that all retail sellers of electricity serve 33 percent of their load with renewable energy by 2020. Executive Order S-21-09 also directed CARB to adopt a regulation by July 31, 2010, requiring the State's load serving entities to meet a 33 percent renewable energy target by 2020. CARB approved the Renewable Electricity Standard on September 23, 2010 by Resolution 10-23. SBX1-2, which codified the 33 percent by 2020 goal.

SB 350 (Clean Energy and Pollution Reduction Act of 2015)

Signed into law on October 7, 2015, SB 350 implements the goals of Executive Order B-30-15. The objectives of SB 350 are to increase the procurement of electricity from renewable sources from 33 percent to 50 percent (with interim targets of 40 percent by 2024, and 25 percent by 2027) and to double the energy efficiency savings in electricity and natural gas end uses of retail customers through energy efficiency and conservation. SB 350 also reorganizes the Independent System Operator to develop more regional electricity transmission markets and improve accessibility in these markets, which will facilitate the growth of renewable energy markets in the western United States.

AB 398 (Market-Based Compliance Mechanisms)

Signed on July 25, 2017, AB 398 extended the duration of the Cap-and-Trade program from 2020 to 2030. AB 398 required CARB to update the Scoping Plan and for all GHG rules and regulations adopted by the State. It also designated CARB as the statewide regulatory body responsible for ensuring that California meets its statewide carbon pollution reduction targets, while retaining local air districts' responsibility and authority to curb toxic air contaminants and criteria pollutants from local sources that severely impact public health. AB 398 also decreased free carbon allowances over 40 percent by 2030 and prioritized Cap-and-Trade spending to various programs including reducing diesel emissions in impacted communities.

SB 150 (Regional Transportation Plans)

Signed on October 10, 2017, SB 150 aligns local and regional GHG reduction targets with State targets (i.e. 40 percent below their 1990 levels by 2030). SB 150 creates a process to include communities in discussions on how to monitor their regions' progress on meeting these goals. The bill also requires the CARB to regularly report on that progress, as well as on the successes and the challenges regions experience associated with achieving their targets. SB 150 provides for accounting of climate change efforts and GHG reductions and identify effective reduction strategies.

SB 100 (California Renewables Portfolio Standard Program: Emissions of Greenhouse Gases)

Signed into Law in September 2018, SB 100 increased California's renewable electricity portfolio from 50 to 60 percent by 2030. SB 100 also established a further goal to have an electric grid that is entirely powered by clean energy by 2045.

Executive Orders Related to GHG Emissions

California's Executive Branch has taken several actions to reduce GHGs using executive orders. Although not regulatory, they set the tone for the State and guide the actions of state agencies.

Executive Order S-3-05. Executive Order S-3-05 was issued on June 1, 2005, which established the following GHG emissions reduction targets:

- By 2010, reduce GHG emissions to 2000 levels.
- By 2020, reduce GHG emissions to 1990 levels.
- By 2050, reduce GHG emissions to 80 percent below 1990 levels.

The 2050 reduction goal represents what some scientists believe is necessary to reach levels that will stabilize the climate. The 2020 goal was established to be a mid-term target. Because this is an executive order, the goals are not legally enforceable for local governments or the private sector.

Executive Order S-01-07. Issued on January 18, 2007, Executive Order S 01-07 mandates that a statewide goal shall be established to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020. The executive order established a Low Carbon Fuel Standard (LCFS) and directed the Secretary for Environmental Protection to coordinate the actions of the California Energy Commission, CARB, the University of California, and other agencies to develop and propose protocols for measuring the "life-cycle carbon intensity" of transportation fuels. CARB adopted the LCFS on April 23, 2009.

Executive Order S-13-08. Issued on November 14, 2008, Executive Order S-13-08 facilitated the California Natural Resources Agency development of the 2009 California Climate Adaptation Strategy. Objectives include analyzing risks of climate change in California, identifying and exploring strategies to adapt to climate change, and specifying a direction for future research.

Executive Order S-14-08. Issued on November 17, 2008, Executive Order S-14-08 expands the State's Renewable Energy Standard to 33 percent renewable power by 2020. Additionally, Executive Order S-21-09 (signed on September 15, 2009) directs CARB to adopt regulations requiring 33 percent of electricity sold in the State come from renewable energy by 2020. CARB adopted the Renewable Electricity Standard on September 23, 2010, which requires 33 percent renewable energy by 2020 for most publicly owned electricity retailers.

Executive Order S-21-09. Issued on July 17, 2009, Executive Order S-21-09 directs CARB to adopt regulations to increase California's RPS to 33 percent by 2020. This builds upon SB 1078 (2002), which established the California Renewable Portfolio Standard (RPS) program, requiring 20 percent renewable energy by 2017, and SB 107 (2006), which advanced the 20 percent deadline to 2010, a goal which was expanded to 33 percent by 2020 in the 2005 Energy Action Plan II.

Executive Order B-30-15. Issued on April 29, 2015, Executive Order B-30-15 established a California GHG reduction target of 40 percent below 1990 levels by 2030 and directs CARB to update the Climate Change Scoping Plan to express the 2030 target in terms of million metric tons of CO_2e (MMTCO2e). The 2030 target acts as an interim goal on the way to achieving reductions of 80 percent below 1990 levels by 2050, a goal set by Executive Order S-3-05. The executive order also requires the State's climate adaptation plan to be updated every three years and for the State to continue its climate change research program, among other provisions. With the enactment of SB 32 in 2016, the Legislature codified the goal of reducing GHG emissions by 2030 to 40 percent below 1990 levels.

Executive Order B-55-18. Issued on September 10, 2018, Executive Order B-55-18 establishes a goal to achieve carbon neutrality as soon as possible, and no later than 2045, and achieve and maintain net negative emissions thereafter. This goal is in addition to the existing statewide targets of reducing GHG emissions. The executive order requires CARB to work with relevant state agencies to develop a framework for implementing this goal. It also requires CARB to update the Scoping Plan to identify and recommend measures to achieve carbon neutrality. The executive order also requires state agencies to develop sequestration targets in the Natural and Working Lands Climate Change Implementation Plan.

Executive Order N-79-20. Signed in September 2020, Executive Order N-79-20 establishes as a goal that where feasible, all new passenger cars and trucks, as well as all drayage/cargo trucks and off-road vehicles and equipment, sold in California, will be zero-emission by 2035. The executive order sets a similar goal requiring that all medium and heavy-duty vehicles will be zero-emission by 2045 where feasible. It also directs CARB to develop and propose rulemaking for passenger vehicles and trucks, medium-and heavy-duty fleets where feasible, drayage trucks, and off-road vehicles and equipment "requiring increasing volumes" of new zero emission vehicles (ZEVs) "towards the target of 100 percent." The executive order directs the California Environmental Protection Agency, the California Geologic Energy Management Division (CalGEM), and the California Natural Resources Agency to transition and repurpose oil production facilities with a goal toward meeting carbon neutrality by 2045. Executive Order N-79-20 builds upon the CARB Advanced Clean Trucks regulation, which was adopted by CARB in July 2020.

California Regulations and Building Codes

California has a long history of adopting regulations to improve energy efficiency in new and remodeled buildings. These regulations have kept California's energy consumption relatively flat even with rapid population growth.

Title 20 Appliance Efficiency Regulations. The appliance efficiency regulations (California Code of Regulations [CCR] Title 20, Sections 1601-1608) include standards for new appliances. Twenty-three categories of appliances are included in the scope of these regulations. These standards include minimum levels of operating efficiency, and other cost-effective measures, to promote the use of energy- and water-efficient appliances.

Title 24 Building Energy Efficiency Standards. California's Energy Efficiency Standards for Residential and Nonresidential Buildings (CCR Title 24, Part 6), was first adopted in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow consideration and possible incorporation of new energy efficient technologies and methods. Energy efficient buildings require less electricity; therefore, increased energy efficiency reduces fossil fuel consumption and decreases GHG emissions. The 2019 Building Energy Efficiency Standards were adopted on May 9, 2018 and took effect on January 1, 2020. Under the 2019 standards, homes will use about 53 percent less energy and nonresidential buildings will use about 30 percent less energy than buildings under the 2016 standards.

Title 24 California Green Building Standards Code. The California Green Building Standards Code (CCR Title 24, Part 11 code) commonly referred to as the CALGreen Code, is a statewide mandatory construction code developed and adopted by the California Building Standards Commission and the Department of Housing and Community Development. The CALGreen standards require new residential and commercial buildings to comply with mandatory measures under the topics of planning and design, energy efficiency, water efficiency/conservation, material conservation and resource efficiency, and environmental quality. CALGreen also provides voluntary tiers and measures that local governments may adopt that encourage or require additional measures in the five green building topics. Updates to the 2016 CALGreen Code took effect on January 1, 2020 (2019 CALGreen). The 2019 CALGreen standards continue to improve upon the standards for new construction of, and additions and alterations to, residential and nonresidential buildings.

CARB Advanced Clean Truck Regulation. CARB adopted the Advanced Clean Truck Regulation in June 2020 requiring truck manufacturers to transition from diesel trucks and vans to electric zero-emission trucks beginning in 2024. By 2045, every new truck sold in California is required to be zero-emission. This rule directly addresses disproportionate risks and health and pollution burdens and puts California on the path for an all zero-emission short-haul drayage fleet in ports and railyards by 2035, and zero-emission "last-mile" delivery trucks and vans by 2040. The Advanced Clean Truck Regulation accelerates the transition of zero-emission medium-and heavy-duty vehicles from Class 2b to Class 8. The regulation has two components including a manufacturer sales requirement, and a reporting requirement:

- Zero-Emission Truck Sales: Manufacturers who certify Class 2b through 8 chassis or complete vehicles with combustion engines are required to sell zero-emission trucks as an increasing percentage of their annual California sales from 2024 to 2035. By 2035, zero-emission truck/chassis sales need to be 55 percent of Class 2b – 3 truck sales, 75 percent of Class 4 – 8 straight truck sales, and 40 percent of truck tractor sales.

- Company and Fleet Reporting: Large employers including retailers, manufacturers, brokers and others would be required to report information about shipments and shuttle services. Fleet owners, with 50 or more trucks, would be required to report about their existing fleet operations. This information would help identify future strategies to ensure that fleets purchase available zero-emission trucks and place them in service where suitable to meet their needs.

3.3 Regional

Mojave Desert Air Quality Management District Thresholds

The MDAQMD has recommended a threshold of 100,000 metric tons per year or 548,000 pounds per day of carbon dioxide equivalent (CO_2eq).

Southern California Association of Governments

On September 3, 2020, SCAG's Regional Council adopted Connect SoCal (2020 - 2045 Regional Transportation Plan/Sustainable Communities Strategy [2020 RTP/SCS]). The RTP/SCS charts a course for closely integrating land use and transportation so that the region can grow smartly and sustainably. The strategy was prepared through a collaborative, continuous, and comprehensive process with input from local governments, county transportation commissions, tribal governments, non-profit organizations, businesses and local stakeholders within the counties of Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura. The RTP/SCS is a long-range vision plan that balances future mobility and housing needs with economic, environmental, and public health goals. The SCAG region strives toward sustainability through integrated land use and transportation planning. The SCAG region must achieve specific federal air quality standards and is required by state law to lower regional GHG emissions.

San Bernardino County Regional Greenhouse Gas Reduction Plan

In response to statewide GHG reduction initiatives, the San Bernardino Associated Governments (formerly SANBAG, now known as San Bernardino Council of Governments or SBCOG), cooperated to compile an inventory of GHG emissions and an evaluation of reduction measures to be adopted by the cities partnering within SBCOG. Reduction measures in the GHG Reduction Plan (GHGRP) are targeting GHG goals for the year 2020. The policies listed in the GHGRP range from broadly supporting energy efficiency and sustainability to policies closely tied to specific GHG reduction measures. Application of these policies is expected to reduce local GHGs by an estimated 387,998 $MTCO_2e$ from "business as usual" levels in 2020. This would equate to a 28.0 percent reduction in GHGs from the 2008 levels of 1,238,926 $MTCO_2e$ annually.

3.4 Local

City of Victorville Climate Action Plan (CAP)

The City has prepared a Climate Action Plan (CAP), which provides a framework for reducing GHG emissions and managing resources to best prepare for a changing climate. In order to determine consistency with the CAP, the City of Victorville provided Screening Tables to aid in measuring the reduction of GHG emissions attributable to certain design and construction measures incorporated into development projects. The CAP establishes categories of GHG reduction measures to reduce GHG emissions generated by development projects. CAP GHG reduction measure categories include energy conservation, water use reduction, increased residential density or mixed uses, transportation management, and solid waste recycling. Within each category, individual sub-measures are assigned a point value under the city's GHG Measures Screening Table. The point values are adjusted according to the intensity of GHG reduction measure. "Modest" Measures that reduce GHG emissions by modest amounts are worth the least number of points; and enhanced GHG emissions reduction measures are worth the most points. Projects that yield at least 45 points are determined to be consistent with the CAP and do not require quantification of project specific GHG emissions. Screening Tables developed for the Project and included in the Project GHGA substantiate that the Project would yield 53 points and would therefore be consistent with the CAP, and further quantification of Project GHG emissions is not required per the CAP. Project GHG emissions have nonetheless been quantified for informational and disclosure purposes. Moreover, projects that are consistent with an adopted CAP may be found to cause a less than significant impact under CEQA. (CEQA Guidelines § 15064(h)(3)). Projects that are consistent with adopted CAPs are also considered to support and would not conflict with an applicable plan, policy or regulation of an agency adopted for the purpose of reducing GHG emissions.

4 SIGNIFICANCE CRITERIA AND METHODOLOGY

4.1 CEQA Thresholds and Significance Criteria

Based upon the criteria derived from Appendix G of the CEQA Guidelines, a project normally would have a significant effect on the environment if it would:

- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment, based on any applicable threshold of significance; or
- Conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of GHGs.

Mojave Desert Air Quality Management District Thresholds

The MDAQMD has recommended a threshold of 100,000 metric tons per year or 548,000 Pounds per day of carbon dioxide equivalent (CO_2eq).

The City of Victorville has not adopted project-specific significance thresholds but the City provides a framework for reducing GHG emissions through the assigning of a point value under the City's GHG Measures Screening Table and managing resources to best prepare for a changing climate.

4.2 Methodology

Global climate change is, by definition, a cumulative impact of GHG emissions. Therefore, there is no project-level analysis. The baseline against which to compare potential impacts of the project includes the natural and anthropogenic drivers of global climate change, including world-wide GHG emissions from human activities which almost doubled between 1970 and 2010 from approximately 27 gigatonnes (Gt) of CO_2/year to nearly 49 GtCO_2/year.[5] As such, the geographic extent of climate change and GHG emissions' cumulative impact discussion is worldwide.

The Project's construction and operational emissions were calculated using the California Emissions Estimator Model version 2020.4.0 (CalEEMod). Details of the modeling assumptions and emission factors are provided in **Appendix A: Greenhouse Gas Emissions Data**. For construction, CalEEMod calculates emissions from off-road equipment usage and on-road vehicle travel associated with haul, delivery, and construction worker trips. GHG emissions during construction were forecasted based on the proposed construction schedule and applying the mobile-source and fugitive dust emissions factors derived from CalEEMod. The Project's construction-related GHG emissions would be generated from off-road construction equipment, on-road hauling and vendor (material delivery) trucks, and worker vehicles.

The Project's operations-related GHG emissions would be generated by vehicular traffic, off-road equipment, area sources (e.g., landscaping maintenance, consumer products), electrical generation, natural gas consumption, water supply and wastewater treatment, and solid waste. The increase of traffic over existing conditions as a result of the Project was obtained from the Project's Trip Generation and Vehicle Miles Traveled Analyses prepared by Kimley-Horn (July 2021).

[5] Intergovernmental Panel on Climate Change, *Climate Change 2014 Mitigation of Climate Change Working Group III Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, 2014.

5 POTENTIAL IMPACTS AND MITIGATION

5.1 Greenhouse Gas Emissions

Threshold 5.1	**Would the Project generate GHG emissions, either directly or indirectly, that could have a significant impact on the environment?**

Short-Term Construction Greenhouse Gas Emissions

The Project would result in direct emissions of GHGs from construction. The approximate quantity of daily GHG emissions generated by construction equipment utilized to build the Project is depicted in **Table 2: Construction-Related Greenhouse Gas Emissions.**

Table 2: Construction-Related Greenhouse Gas Emissions

Category	$MTCO_2e$
Construction	547
30-Year Amortized Construction	18
Source: CalEEMod version 2020.4.0. Refer to Appendix A for model outputs.	

As shown, the Project would result in the generation of approximately 547 $MTCO_2e$ over the course of construction. Construction GHG emissions are typically summed and amortized over the lifetime of the Project (assumed to be 30 years), then added to the operational emissions[6]. The amortized Project construction emissions would be 18 $MTCO_2e$ per year. Once construction is complete, the generation of these GHG emissions would cease.

Long-Term Operational Greenhouse Gas Emissions

Operational or long-term emissions occur over the life of the Project. GHG emissions would result from direct emissions such as Project generated vehicular traffic, on-site combustion of natural gas, and operation of any landscaping equipment. Operational GHG emissions would also result from indirect sources, such as off-site generation of electrical power, the energy required to convey water to, and wastewater from the Project, the emissions associated with solid waste generated from the Project, and any fugitive refrigerants from air conditioning or refrigerators.

Total GHG emissions associated with the Project are summarized in **Table 3: Project Greenhouse Gas Emissions**. As shown in **Table 3**, the Project would generate approximately 5,010 $MTCO_2e$ annually from both construction and operations of the Project. Project related GHG emissions would not exceed the threshold of 100,000 MT CO_2e/year and thus would result in a less than significant impact.

[6] The project lifetime is based on the standard 30-year assumption of the South Coast Air Quality Management District (South Coast Air Quality Management District, *Minutes for the GHG CEQA Significance Threshold Stakeholder Working Group #13,* August 26, 2009).

Table 3: Project Greenhouse Gas Emissions	
Emissions Source	**$MTCO_2e$ per Year**
Area	0.005
Energy	121
Mobile	4,834
Waste	29
Water	8
Amortized Construction Emissions	18
Total Annual Project GHG Emissions	5,010
Threshold	100,000
Exceeds Threshold?	**No**
Source: CalEEMod version 2020.4.0. Refer to Appendix A for model outputs. Note: Total values are from CalEEMod and may not add up 100% due to rounding.	

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

5.2 Greenhouse Gas Reduction Plan Compliance

Threshold 5.2	**Would the Project conflict with an applicable plan, policy, or regulation of an agency adopted for the purpose of reducing GHG emissions?**

City of Victorville Climate Action Plan Consistency

The City has prepared a Climate Action Plan (CAP), which provides a framework for reducing GHG emissions and managing resources to best prepare for a changing climate. In order to determine consistency with the CAP, the City of Victorville provided Screening Tables to aid in measuring the reduction of GHG emissions attributable to certain design and construction measures incorporated into development projects. The CAP establishes categories of GHG reduction measures to reduce GHG emissions generated by development projects. CAP GHG reduction measure categories include energy conservation, water use reduction, increased residential density or mixed uses, transportation management, and solid waste recycling. Within each category, individual sub-measures are assigned a point value under the city's GHG Measures Screening Table. The point values are adjusted according to the intensity of GHG reduction measure. "Modest" Measures that reduce GHG emissions by modest amounts are worth the least number of points; and enhanced GHG emissions reduction measures are worth the most points. Projects that yield at least 45 points are determined to be consistent with the CAP and do not require quantification of project specific GHG emissions. Screening Tables developed for the Project and included in this analysis.

According to **Table 4: City of Victorville Climate Action Plan Screening Table Consistency,** the Project would potentially yield 68 points and would therefore be consistent with the CAP, and further quantification of Project GHG emissions is not required per the CAP. Project GHG emissions have nonetheless been quantified (refer to **Table 3**) for informational and disclosure purposes. Moreover, projects that are consistent with an adopted CAP may be found to cause a less than significant impact under CEQA (CEQA Guidelines § 15064(h)(3)). Projects that are consistent with adopted CAPs are also considered to support and would not conflict with an applicable plan, policy or regulation of an agency adopted for the purpose of reducing GHG emissions. **Table 4** shows that the Project would be consistent with the CAP. Mitigation Measure GHG-1 would ensure the project achieves a minimum of 45 points required by the City of Victorville. Project GHG emissions impacts on the environment are therefore considered less than significant. Additionally, because the Project would be consistent with the CAP, the Project would not conflict with an applicable plan, policy or regulation of an agency adopted for the purpose of reducing GHG emissions.

Table 4: City of Victorville Climate Action Plan Screening Table Consistency

Feature	Description	Project Points
Insulation:	Modestly Enhanced Insulation (walls R-13, roof/attic R-38))	15
Cool Roof:	Modest Cool Roof (CRRC Rated 0.15 aged solar reflectance, 0.75 thermal emittance)	12
Air Infiltration:	Blower Door HERS Verified Envelope Leakage or equivalent	10
Heating/Cooling Distribution System:	Modest Duct insulation (R-6)	8
Water Heaters:	Improved Efficiency Water Heater (0.675 Energy Factor)	14
Water Efficient Landscaping:	Only moderate water using plants	3
Water Efficient Irrigation Systems:	Low precipitation spray heads< 0.75"/hr or drip irrigation	1
	Weather based irrigation control systems combined with drip irrigation (demonstrate 20 reduced water use)	5
	Total	**68**

Source: City of Victorville*, Greenhouse Gas Emissions Screening Table Review*, 2021.

Regional Transportation Plan/Sustainable Communities Strategy Consistency

On September 3, 2020, SCAG's Regional Council adopted Connect SoCal (*2020-2045 Regional Transportation Plan/Sustainable Communities Strategy* [2020 RTP/SCS]). The RTP/SCS is a long-range visioning plan that balances future mobility and housing needs with economic, environmental, and public health goals. The RTP/SCS embodies a collective vision for the region's future and is developed with input from local governments, county transportation commissions, tribal governments, nonprofit organizations, businesses, and local stakeholders in the counties of Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura. SCAG's RTP/SCS establishes GHG emissions goals for automobiles and light-duty trucks for 2020 and 2035 as well as an overall GHG target for the Project region consistent with both the target date of AB 32 and the post-2020 GHG reduction goals of Executive Orders 5-03-05 and B-30-15.

The RTP/SCS contains over 4,000 transportation projects, ranging from highway improvements, railroad grade separations, bicycle lanes, new transit hubs and replacement bridges. These future investments were included in county plans developed by the six county transportation commissions and seek to reduce traffic bottlenecks, improve the efficiency of the region's network, and expand mobility choices for everyone. The RTP/SCS is an important planning document for the region, allowing project sponsors to qualify for federal funding.

The plan accounts for operations and maintenance costs to ensure reliability, longevity, and cost effectiveness. The RTP/SCS is also supported by a combination of transportation and land use strategies that help the region achieve state GHG emissions reduction goals and Federal Clean Air Act (FCAA) requirements, preserve open space areas, improve public health and roadway safety, support our vital goods movement industry, and utilize resources more efficiently. GHG emissions resulting from development-related mobile sources are the most potent source of emissions, and therefore Project comparison to the RTP/SCS is an appropriate indicator of whether the Project would inhibit the post-2020 GHG reduction goals promulgated by the state. The Project's consistency with the RTP/SCS goals is analyzed in detail in **Table 5: Regional Transportation Plan/Sustainable Communities Strategy Consistency**.

Compliance with applicable State standards (e.g., continuation of the Cap-and-Trade regulation; CARB's Mobile Source Strategy, Sustainable Freight Action Plan, and Advanced Clean Truck Regulation; Executive Order N-79-20; SB 100/renewable electricity portfolio improvements that require 60 percent renewable electricity by 2030 and 100 percent renewable by 2045, etc.) would ensure consistency with State and regional GHG reduction planning efforts. The goals stated in the RTP/SCS were used to determine consistency with the planning efforts previously stated. As shown in **Table 5**, the proposed Project would be consistent with the stated goals of the RTP/SCS. Therefore, the proposed Project would not result in any significant impacts or interfere with SCAG's ability to achieve the region's post-2020 mobile source GHG reduction targets.

Table 5: Regional Transportation Plan/Sustainable Communities Strategy Consistency

SCAG Goals		Compliance	
GOAL 1:	Encourage regional economic prosperity and global competitiveness.	N/A:	This is not a project-specific policy and is therefore not applicable. However, the Project is located in a commercial area in proximity to existing development. The development of the site would contribute to regional economic prosperity.
GOAL 2:	Improve mobility, accessibility, reliability, and travel safety for people and goods.	Consistent:	This is not a project-specific policy. However, the Project would not exceed any air quality thresholds. Victor Valley Transit route 45 bus stop is approximately 160 feet southeast of the Project site. Also, it should be noted that the project is a fueling station that would serve existing vehicles to improve mobility, accessibility, reliability, and travel safety for people and goods.
GOAL 3:	Enhance the preservation, security, and resilience of the regional transportation system.	N/A:	This is not a transportation improvement project and is therefore not applicable.
GOAL 4:	Increase person and goods movement and travel choices within the transportation system.	N/A:	This is not a transportation improvement project and is therefore not applicable. However, the Project includes a fueling station use with amenities that would support goods movement.

Table 5: Regional Transportation Plan/Sustainable Communities Strategy Consistency

SCAG Goals		**Compliance**	
GOAL 5:	Reduce greenhouse gas emissions and improve air quality.	N/A:	The Project is located within a commercial area in proximity to existing truck routes and freeways. The project is surrounded by existing commercial development and considered an infill site. The California Air Pollution Control Officers Association, *Quantifying Greenhouse Gas Mitigation Measures* (August 2010) identifies that infill developments, such as the proposed Project reduce vehicle miles traveled which reduces fuel consumption. Infill projects such as the proposed Project would have an improved location efficiency, which would reduce GHG and air quality emissions.
GOAL 6:	Support healthy and equitable communities.	Consistent:	The reduction of energy use, improvement of air quality, and promotion of more environmentally sustainable development are encouraged through the development of alternative transportation methods, green design techniques for buildings, and other energy-reducing techniques. This development project is required to comply with the provisions of the California Building Energy Efficiency Standards and the Green Building Standards Code (CALGreen). As discussed in the Air Quality Assessment, the Project would not result in health impacts. The Project is located on a site that is currently zoned Commercial and would not conflict with the surrounding community's ability to access healthy food or parks.
GOAL 7:	Adapt to a changing climate and support an integrated regional development pattern and transportation network.	N/A:	This is not a project-specific policy and is therefore not applicable.
GOAL 8:	Leverage new transportation technologies and data-driven solutions that result in more efficient travel.	Consistent:	The Project involves a fueling station development and the site is bounded by Nisqualli Road to the south, Interstate-15 Freeway to the west, and Mariposa Road to the east. The Project would not disrupt land use patterns that facilitate transit and motorized/non-motorized transportation. The Project is located in a developed area in proximity to existing truck routes and freeways. As noted above, the project is surrounded by existing commercial development and considered an infill site. The California Air Pollution Control Officers Association, *Quantifying Greenhouse Gas Mitigation Measures* (August 2010) identifies that infill developments, such as the proposed Project reduce vehicle miles traveled which reduces fuel consumption. Infill projects such as the proposed Project would have an improved location efficiency, which would result in more efficient travel.
GOAL 9:	Encourage development of diverse housing types in areas that are supported by multiple transportation options.	N/A:	The Project involves development of a fueling station and does not include housing.

Table 5: Regional Transportation Plan/Sustainable Communities Strategy Consistency	
SCAG Goals	**Compliance**
Goal 10: Promote conservation of natural and agricultural lands and restoration of habitats.	This Project is not located on agricultural or habitat lands.
Source: Southern California Association of Governments, Connect SoCal, *Regional Transportation Plan/Sustainable Communities Strategy*, 2020.	

California Air Resource Board Scoping Plan Consistency

The California State Legislature adopted Assembly Bill (AB) 32 in 2006. AB 32 focuses on reducing GHGs (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) to 1990 levels by the year 2020. Pursuant to the requirements in AB 32, CARB adopted the *Climate Change Scoping Plan* (Scoping Plan) in 2008, which outlines actions recommended to obtain that goal. The Scoping Plan provides a range of GHG reduction actions that include direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, market-based mechanisms such as the cap-and-trade program, and an AB 32 implementation fee to fund the program. As shown in **Table 6: Project Consistency with Applicable CARB Scoping Plan Measures**, the Project is consistent with most of the strategies, while others are not applicable to the Project.

The 2017 Scoping Plan Update identifies additional GHG reduction measures necessary to achieve the 2030 target. These measures build upon those identified in the first update to the Scoping Plan in 2013. Although a number of these measures are currently established as policies and measures, some measures have not yet been formally proposed or adopted. It is expected that these actions to reduce GHG emissions will be adopted as required to achieve statewide GHG emissions targets. As such, impacts related to consistency with the Scoping Plan would be less than significant.

Table 6: Project Consistency with Applicable CARB Scoping Plan Measures			
Scoping Plan Sector	**Scoping Plan Measure**	**Implementing Regulations**	**Project Consistency**
Transportation	California Cap-and-Trade Program Linked to Western Climate Initiative	Regulation for the California Cap on GHG Emissions and Market-Based Compliance Mechanism October 20, 2015 (CCR 95800)	**Consistent.** The Cap-and-Trade Program applies to large industrial sources such as power plants, refineries, and cement manufacturers. However, the regulation indirectly affects people who use the products and services produced by these industrial sources when increased cost of products or services (such as electricity and fuel) are transferred to the consumers. The Cap-and-Trade Program covers the GHG emissions associated with electricity consumed in California, generated in-state or imported. Accordingly, GHG emissions associated with CEQA projects' electricity usage are covered by the Cap-and-Trade Program. The Cap-and-Trade Program also covers fuel suppliers (natural gas and propane fuel providers and transportation fuel providers) to address emissions from such fuels and combustion of other fossil fuels not directly covered at large sources in the Program's first compliance period.
	California Light-Duty Vehicle GHG Standards	Pavley I 2005 Regulations to Control GHG Emissions from Motor Vehicles	**Consistent**. This measure applies to all new vehicles starting with model year 2012. The Project would not conflict with its implementation as it would apply to all new passenger vehicles purchased in California.

Table 6: Project Consistency with Applicable CARB Scoping Plan Measures

Scoping Plan Sector	Scoping Plan Measure	Implementing Regulations	Project Consistency
		Pavley I 2005 Regulations to Control GHG Emissions from Motor Vehicles	Passenger vehicles sold after the effective dates of the standards would comply with the Pavley emissions standards.
		2012 LEV III California GHG and Criteria Pollutant Exhaust and Evaporative Emission Standards	**Consistent.** The LEV III amendments provide reductions from new vehicles sold in California between 2017 and 2025. Passenger vehicles associated with the site would comply with LEV III standards.
	Low Carbon Fuel Standard	2009 readopted in 2015. Regulations to Achieve GHG Emission Reductions Sub-article 7. Low Carbon Fuel Standard CCR 95480	**Consistent.** This measure applies to transportation fuels utilized by vehicles in California. The Project would not conflict with implementation of this measure. Motor vehicles associated with construction and operation of the Project would utilize low carbon transportation fuels as required under this measure.
	Regional Transportation-Related GHG Targets.	SB 375. Cal. Public Resources Code §§ 21155, 21155.1, 21155.2, 21159.28	**Consistent**. The Project would provide development in the region that is consistent with the growth projections in the RTP/SCS.
	Goods Movement	Goods Movement Action Plan January 2007	**Not applicable**. The Project does not propose any changes to maritime, rail, or intermodal facilities or forms of transportation.
	Medium/Heavy-Duty Vehicle	2010 Amendments to the Truck and Bus Regulation, the Drayage Truck Regulation and the Tractor-Trailer GHG Regulation	**Consistent**. This measure applies to medium and heavy-duty vehicles that operate in the state. The Project would not conflict with implementation of this measure. Medium and heavy-duty vehicles associated with construction and operation of the Project would be required to comply with the requirements of this regulation.
	High Speed Rail	Funded under SB 862	**Not applicable**. This is a statewide measure that cannot be implemented by a project applicant or Lead Agency.
Electricity and Natural Gas	Energy Efficiency	Title 20 Appliance Efficiency Regulation	**Consistent.** The Project would not conflict with implementation of this measure. The Project would comply with the latest energy efficiency standards.
		Title 24 Part 6 Energy Efficiency Standards for Residential and Non-Residential Building	
		Title 24 Part 11 California Green Building Code Standards	
	Renewable Portfolio Standard/Renewable Electricity Standard.	2010 Regulation to Implement the Renewable Electricity Standard (33% 2020)	**Consistent**. The Project would obtain electricity from the electric utility, Southern California Edison (SCE). SCE obtained 36 percent of its power supply from renewable sources in 2019. Therefore, the utility would provide power when needed on site that is composed of a greater percentage of renewable sources.
	Million Solar Roofs Program	SB 350 Clean Energy and Pollution Reduction Act of 2015 (50% 2030)	
	Million Solar Roofs Program	Tax Incentive Program	**Consistent.** This measure is to increase solar throughout California, which is being done by various electricity providers and existing solar programs. The program provides incentives that are in place at the time of construction.

Table 6: Project Consistency with Applicable CARB Scoping Plan Measures

Scoping Plan Sector	Scoping Plan Measure	Implementing Regulations	Project Consistency
Water	Water	Title 24 Part 11 California Green Building Code Standards SBX 7-7—The Water Conservation Act of 2009 Model Water Efficient Landscape Ordinance	**Consistent.** The Project would comply with the CalGreen standards, which requires a 20 percent reduction in indoor water use. The Project would also comply with the City's Water-Efficient Landscaping Regulations (Chapter 13.60 of the Victorville Municipal Code).
Green Buildings	Green Building Strategy	Title 24 Part 11 California Green Building Code Standards	**Consistent.** The State is to increase the use of green building practices. The Project would implement required green building strategies through existing regulation that requires the Project to comply with various CalGreen requirements. The Project includes sustainability design features that support the Green Building Strategy.
Industry	Industrial Emissions	2010 CARB Mandatory Reporting Regulation	**Not applicable.** The Mandatory Reporting Regulation requires facilities and entities with more than 10,000 $MTCO_2e$ of combustion and process emissions, all facilities belonging to certain industries, and all electric power entities to submit an annual GHG emissions data report directly to CARB. As shown above, total Project GHG emissions would not exceed 100,000 $MTCO_2e$. Therefore, this regulation would not apply.
Recycling and Waste Management	Recycling and Waste	Title 24 Part 11 California Green Building Code Standards AB 341 Statewide 75 Percent Diversion Goal	**Consistent.** The Project would not conflict with implementation of these measures. The Project is required to achieve the recycling mandates via compliance with the CALGreen code. The City has consistently achieved its state recycling mandates.
Forests	Sustainable Forests	Cap and Trade Offset Projects	**Not applicable.** The Project is in an area designated for commercial uses. No forested lands exist on-site.
High Global Warming Potential	High Global Warming Potential Gases	CARB Refrigerant Management Program CCR 95380	**Not applicable**. The regulations are applicable to refrigerants used by large air conditioning systems and large commercial and industrial refrigerators and cold storage system. The Project would not conflict with the refrigerant management regulations adopted by CARB.
Agriculture	Agriculture	Cap and Trade Offset Projects for Livestock and Rice Cultivation	**Not applicable**. The Project site is designated for commercial development. No grazing, feedlot, or other agricultural activities that generate manure occur currently exist on-site or are proposed to be implemented by the Project.

Source: California Air Resources Board, *California's 2017 Climate Change Scoping Plan*, November 2017 and CARB, *Climate Change Scoping Plan*, December 2008.

The Project would generate approximately 5,010 $MTCO_2e$ per year directly from on-site activities and indirectly from off-site motor vehicles. GHG emissions would not exceed MDAQMD thresholds and would be less than significant.

Regarding goals for 2050 under Executive Order S-3-05, at this time it is not possible to quantify the emissions savings from future regulatory measures, as they have not yet been developed; nevertheless, it can be anticipated that operation of the proposed Project would benefit from the implementation of current and potential future regulations (e.g., improvements in vehicle emissions, SB 100/renewable electricity portfolio improvements, CARB's Mobile Source Strategy, etc.) enacted to meet an 80 percent reduction below 1990 levels by 2050.

The Project would not conflict with any applicable plan, policy, or regulation of an agency adopted for reducing the emissions of GHGs because the Project would generate low levels of GHGs, and would not impede implementation of the Scoping Plan, or conflict with the policies of the Scoping Plan or any other GHG reduction plan. Therefore, the impacts would be less than significant.

Mitigation Measures:

GHG-1 Prior to the issuance of building permits, the City shall confirm that the Project design implements a minimum of 45 points of GHG reduction measures listed in the City's GHG Emissions Screening Tables. The reduction measures may consist of the following measures, although alternate measures totaling 45 points may be selected:

- **Insulation:** Modestly Enhanced Insulation (walls R-13, roof/attic R-38))
- **Cool Roof:** Modest Cool Roof (CRRC Rated 0.15 aged solar reflectance, 0.75 thermal emittance)
- **Air Infiltration**: Blower Door HERS Verified Envelope Leakage or equivalent
- **HVAC**: Modest Duct insulation (R-6)
- **Water Heaters**: Improved Efficiency Water Heater (0.675 Energy Factor)
- **Water Efficient Landscaping**: Only moderate water using plants
- **Water Efficient Irrigation Systems**: Low precipitation spray heads< 0.75"/hr or drip irrigation
- **Water Efficient Irrigation Systems**: Weather based irrigation control systems combined with drip irrigation (demonstrate 20 reduced water use)

Level of Significance: Less than significant impact with mitigation incorporated.

5.3 Cumulative Setting, Impacts, and Mitigation Measures

Cumulative Setting

Climate change is a global problem. GHGs are global pollutants, unlike criteria air pollutants and TACs, which are pollutants of regional and local concern. Whereas pollutants with localized air quality effects have relatively short atmospheric lifetimes (about 1 day), GHGs have much longer atmospheric lifetimes of 1 year to several thousand years that allow them to be dispersed around the globe.

Cumulative Impacts

It is generally the case that an individual project of this size and nature is of insufficient magnitude by itself to influence climate change or result in a substantial contribution to the global GHG inventory. GHG impacts are recognized as exclusively cumulative impacts; there are no non-cumulative GHG emission impacts from a climate change perspective. The additive effect of Project-related GHGs would not result in a reasonably foreseeable cumulatively considerable contribution to global climate change. In addition, the Project as well as other cumulative related projects would also be subject to all applicable regulatory requirements, which would further reduce GHG emissions. As shown in Table 4 and Table 5, the Project would not conflict with the RTP/SCS, or the CARB Scoping Plan. As a result, the Project would not conflict with any GHG reduction plans. Therefore, the Project's cumulative contribution of GHG emissions would be less than significant and the Project's cumulative GHG impacts would also be less than cumulatively considerable.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

6 REFERENCES

1. California Air Resources Board, *California's 2017 Climate Change Scoping Plan,* 2017.
2. City of Victorville, *City of Victorville Climate Action Plan*, 2015.
3. Intergovernmental Panel on Climate Change, *Climate Change 2007: The Physical Science Basis*, 2007.
4. Intergovernmental Panel on Climate Change, *Climate Change 2013: The Physical Science Basis, Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, 2013.
5. Kimley-Horn, *Maverik (Nisqualli & Mariposa) Transportation Study*, July 2021.
6. National Research Council, *Advancing the Science of Climate Change*, 2010.
7. Maverik Inc., Site Plan, Fit Study Analysis 06, May 2021.
8. Mojave Desert Air Quality Management District, *California Environmental Quality Act (CEQA) and Federal Conformity Guidelines*, August 2016.
9. San Bernardino County Transportation Authority, *San Bernardino County Regional Greenhouse Gas Reduction Plan*, March 2014.
10. State of California, *Code of Regulations Section 15065.5a*, 2018.
11. Southern California Association of Governments, Connect SoCal - *2020 - 2045 Regional Transportation Plan/Sustainable Communities Strategy*, 2020.
12. U.S. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016*, 2018.
13. U.S. EPA, *Methane and Nitrous Oxide Emission from Natural Sources*, 2010.
14. U.S. EPA, *Overview of Greenhouse Gases*, 2018.

Appendix A

Greenhouse Gas Emissions Data

Victorville Nasqualli - Maverick (CalEEMod)

San Bernardino-Mojave Desert County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Fast Food Restaurant with Drive Thru	2.98	1000sqft	0.07	2,981.00	0
Convenience Market With Gas Pumps	6.10	1000sqft	0.14	6,103.00	0
Gasoline/Service Station	9.00	Pump	0.03	1,270.57	0
Other Asphalt Surfaces	251.78	1000sqft	5.78	251,780.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.6	**Precipitation Freq (Days)**	32
Climate Zone	10			**Operational Year**	2023
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Construction Phase - Anticipated construction schedule

Off-road Equipment - No demolition

Grading -

Vehicle Trips - Per Traffic Study

Fleet Mix - Fleet Mix

Construction Off-road Equipment Mitigation - MDAQMD Rule Compliance

Water Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	CleanPavedRoadPercentReduction	0	6
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	12
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	20.00	60.00
tblConstructionPhase	NumDays	230.00	170.00
tblConstructionPhase	NumDays	20.00	0.00
tblConstructionPhase	NumDays	20.00	50.00
tblConstructionPhase	NumDays	10.00	20.00
tblConstructionPhase	PhaseEndDate	3/24/2023	12/23/2022
tblConstructionPhase	PhaseEndDate	1/27/2023	10/20/2022
tblConstructionPhase	PhaseEndDate	1/28/2022	1/2/2022
tblConstructionPhase	PhaseEndDate	3/11/2022	2/25/2022
tblConstructionPhase	PhaseEndDate	2/24/2023	12/9/2022
tblConstructionPhase	PhaseEndDate	2/11/2022	1/28/2022
tblConstructionPhase	PhaseStartDate	2/25/2023	10/1/2022
tblConstructionPhase	PhaseStartDate	3/12/2022	2/25/2022

tblConstructionPhase	PhaseStartDate	2/12/2022	1/29/2022
tblConstructionPhase	PhaseStartDate	1/28/2023	10/1/2022
tblConstructionPhase	PhaseStartDate	1/29/2022	1/3/2022
tblFleetMix	HHD	0.06	1.00
tblFleetMix	LDA	0.56	0.00
tblFleetMix	LDT1	0.04	0.00
tblFleetMix	LDT2	0.18	0.00
tblFleetMix	LHD1	0.02	0.00
tblFleetMix	LHD2	4.9390e-003	0.00
tblFleetMix	MCY	5.8070e-003	0.00
tblFleetMix	MDV	0.11	0.00
tblFleetMix	MH	8.8400e-004	0.00
tblFleetMix	MHD	0.02	0.00
tblFleetMix	OBUS	1.3640e-003	0.00
tblFleetMix	SBUS	8.0300e-004	0.00
tblFleetMix	UBUS	1.5280e-003	0.00
tblGrading	MaterialExported	0.00	14,347.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblTripsAndVMT	WorkerTripNumber	0.00	15.00
tblVehicleTrips	DV_TP	21.00	0.00
tblVehicleTrips	DV_TP	21.00	0.00
tblVehicleTrips	DV_TP	27.00	0.00
tblVehicleTrips	PB_TP	65.00	0.00
tblVehicleTrips	PB_TP	50.00	0.00
tblVehicleTrips	PB_TP	59.00	0.00

tblVehicleTrips	PR_TP	14.00	100.00
tblVehicleTrips	PR_TP	29.00	100.00
tblVehicleTrips	PR_TP	14.00	100.00
tblVehicleTrips	ST_TR	1,448.33	357.04
tblVehicleTrips	ST_TR	722.03	102.31
tblVehicleTrips	ST_TR	168.56	32.00
tblVehicleTrips	SU_TR	1,182.08	357.04
tblVehicleTrips	SU_TR	542.72	102.31
tblVehicleTrips	SU_TR	168.56	32.00
tblVehicleTrips	WD_TR	845.60	357.04
tblVehicleTrips	WD_TR	496.12	102.31
tblVehicleTrips	WD_TR	168.56	32.00

2.0 Emissions Summary

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	0.4958	2.7464	2.5281	6.0700e-003	0.3727	0.1125	0.4852	0.1672	0.1052	0.2724	0.0000	544.6912	544.6912	0.0947	0.0000	547.0589
Maximum	**0.4958**	**2.7464**	**2.5281**	**6.0700e-003**	**0.3727**	**0.1125**	**0.4852**	**0.1672**	**0.1052**	**0.2724**	**0.0000**	**544.6912**	**544.6912**	**0.0947**	**0.0000**	**547.0589**

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	0.4958	2.7464	2.5281	6.0700e-003	0.2250	0.1125	0.3375	0.0894	0.1052	0.1946	0.0000	544.6909	544.6909	0.0947	0.0000	547.0585
Maximum	**0.4958**	**2.7464**	**2.5281**	**6.0700e-003**	**0.2250**	**0.1125**	**0.3375**	**0.0894**	**0.1052**	**0.1946**	**0.0000**	**544.6909**	**544.6909**	**0.0947**	**0.0000**	**547.0585**

	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**	**39.64**	**0.00**	**30.44**	**46.51**	**0.00**	**28.54**	**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	1-3-2022	4-2-2022	1.0511	1.0511
2	4-3-2022	7-2-2022	0.7175	0.7175
3	7-3-2022	9-30-2022	0.7096	0.7096
		Highest	1.0511	1.0511

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	tons/yr										MT/yr					
Area	0.0777	2.0000e-005	2.4800e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.8200e-003	4.8200e-003	1.0000e-005	0.0000	5.1400e-003
Energy	4.6900e-003	0.0426	0.0358	2.6000e-004		3.2400e-003	3.2400e-003		3.2400e-003	3.2400e-003	0.0000	120.1897	120.1897	3.9400e-003	1.4800e-003	120.7295
Mobile	0.7867	10.0394	8.6249	0.0513	2.8516	0.0248	2.8765	0.7664	0.0233	0.7897	0.0000	4,826.8161	4,826.8161	0.2821	0.0000	4,833.8690
Waste						0.0000	0.0000		0.0000	0.0000	11.6740	0.0000	11.6740	0.6899	0.0000	28.9219
Water						0.0000	0.0000		0.0000	0.0000	0.4682	7.5673	8.0355	0.0484	1.2000e-003	9.6033
Total	**0.8691**	**10.0820**	**8.6632**	**0.0516**	**2.8516**	**0.0281**	**2.8797**	**0.7664**	**0.0265**	**0.7929**	**12.1423**	**4,954.5779**	**4,966.7202**	**1.0244**	**2.6800e-003**	**4,993.1288**

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	0.0777	2.0000e-005	2.4800e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.8200e-003	4.8200e-003	1.0000e-005	0.0000	5.1400e-003
Energy	4.6900e-003	0.0426	0.0358	2.6000e-004		3.2400e-003	3.2400e-003		3.2400e-003	3.2400e-003	0.0000	120.1897	120.1897	3.9400e-003	1.4800e-003	120.7295
Mobile	0.7867	10.0394	8.6249	0.0513	2.8516	0.0248	2.8765	0.7664	0.0233	0.7897	0.0000	4,826.8161	4,826.8161	0.2821	0.0000	4,833.8690
Waste						0.0000	0.0000		0.0000	0.0000	11.6740	0.0000	11.6740	0.6899	0.0000	28.9219
Water						0.0000	0.0000		0.0000	0.0000	0.3746	6.2545	6.6291	0.0387	9.6000e-004	7.8841
Total	**0.8691**	**10.0820**	**8.6632**	**0.0516**	**2.8516**	**0.0281**	**2.8797**	**0.7664**	**0.0265**	**0.7929**	**12.0486**	**4,953.2652**	**4,965.3138**	**1.0147**	**2.4400e-003**	**4,991.4096**

	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**	**0.77**	**0.03**	**0.03**	**0.94**	**8.96**	**0.03**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/3/2022	1/2/2022	5	0	
2	Site Preparation	Site Preparation	1/3/2022	1/28/2022	5	20	
3	Grading	Grading	1/29/2022	2/25/2022	5	20	
4	Building Construction	Building Construction	2/25/2022	10/20/2022	5	170	
5	Paving	Paving	10/1/2022	12/9/2022	5	50	
6	Architectural Coating	Architectural Coating	10/1/2022	12/23/2022	5	60	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 10

Acres of Paving: 5.78

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 15,532; Non-Residential Outdoor: 5,177; Striped Parking Area: 15,107 (Architectural Coating – sqft)

<u>OffRoad Equipment</u>

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Demolition	Excavators	0	8.00	158	0.38
Demolition	Concrete/Industrial Saws	0	8.00	81	0.73
Grading	Excavators	1	8.00	158	0.38
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Paving	Pavers	2	8.00	130	0.42
Paving	Rollers	2	8.00	80	0.38
Demolition	Rubber Tired Dozers	0	8.00	247	0.40
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Grading	Graders	1	8.00	187	0.41
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Paving	Paving Equipment	2	8.00	132	0.36
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
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
Demolition	0	15.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	7	18.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	6	15.00	0.00	1,793.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	109.00	43.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	22.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Replace Ground Cover

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

Clean Paved Roads

3.2 Demolition - 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	0.0000	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
Total	**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**

3.2 Demolition - 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	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	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
Total	**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**

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	0.0000	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
Total	**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**

3.2 Demolition - 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	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	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
Total	**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**

3.3 Site Preparation - 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					0.1807	0.0000	0.1807	0.0993	0.0000	0.0993	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0317	0.3308	0.1970	3.8000e-004		0.0161	0.0161		0.0148	0.0148	0.0000	33.4394	33.4394	0.0108	0.0000	33.7098
Total	**0.0317**	**0.3308**	**0.1970**	**3.8000e-004**	**0.1807**	**0.0161**	**0.1968**	**0.0993**	**0.0148**	**0.1142**	**0.0000**	**33.4394**	**33.4394**	**0.0108**	**0.0000**	**33.7098**

3.3 Site Preparation - 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	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	6.2000e-004	4.3000e-004	4.5300e-003	1.0000e-005	1.4500e-003	1.0000e-005	1.4600e-003	3.9000e-004	1.0000e-005	3.9000e-004	0.0000	1.1690	1.1690	3.0000e-005	0.0000	1.1698
Total	**6.2000e-004**	**4.3000e-004**	**4.5300e-003**	**1.0000e-005**	**1.4500e-003**	**1.0000e-005**	**1.4600e-003**	**3.9000e-004**	**1.0000e-005**	**3.9000e-004**	**0.0000**	**1.1690**	**1.1690**	**3.0000e-005**	**0.0000**	**1.1698**

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					0.0772	0.0000	0.0772	0.0425	0.0000	0.0425	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0317	0.3308	0.1970	3.8000e-004		0.0161	0.0161		0.0148	0.0148	0.0000	33.4394	33.4394	0.0108	0.0000	33.7097
Total	**0.0317**	**0.3308**	**0.1970**	**3.8000e-004**	**0.0772**	**0.0161**	**0.0934**	**0.0425**	**0.0148**	**0.0573**	**0.0000**	**33.4394**	**33.4394**	**0.0108**	**0.0000**	**33.7097**

3.3 Site Preparation - 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	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	6.2000e-004	4.3000e-004	4.5300e-003	1.0000e-005	1.3800e-003	1.0000e-005	1.3800e-003	3.7000e-004	1.0000e-005	3.8000e-004	0.0000	1.1690	1.1690	3.0000e-005	0.0000	1.1698
Total	**6.2000e-004**	**4.3000e-004**	**4.5300e-003**	**1.0000e-005**	**1.3800e-003**	**1.0000e-005**	**1.3800e-003**	**3.7000e-004**	**1.0000e-005**	**3.8000e-004**	**0.0000**	**1.1690**	**1.1690**	**3.0000e-005**	**0.0000**	**1.1698**

3.4 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					0.0665	0.0000	0.0665	0.0338	0.0000	0.0338	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0195	0.2086	0.1527	3.0000e-004		9.4100e-003	9.4100e-003		8.6600e-003	8.6600e-003	0.0000	26.0548	26.0548	8.4300e-003	0.0000	26.2654
Total	**0.0195**	**0.2086**	**0.1527**	**3.0000e-004**	**0.0665**	**9.4100e-003**	**0.0759**	**0.0338**	**8.6600e-003**	**0.0425**	**0.0000**	**26.0548**	**26.0548**	**8.4300e-003**	**0.0000**	**26.2654**

3.4 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	5.1300e-003	0.1917	0.0326	6.8000e-004	0.0154	4.8000e-004	0.0159	4.2400e-003	4.6000e-004	4.7000e-003	0.0000	65.6280	65.6280	3.6400e-003	0.0000	65.7191
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	5.1000e-004	3.6000e-004	3.7800e-003	1.0000e-005	1.2100e-003	1.0000e-005	1.2200e-003	3.2000e-004	1.0000e-005	3.3000e-004	0.0000	0.9742	0.9742	3.0000e-005	0.0000	0.9749
Total	**5.6400e-003**	**0.1920**	**0.0364**	**6.9000e-004**	**0.0166**	**4.9000e-004**	**0.0171**	**4.5600e-003**	**4.7000e-004**	**5.0300e-003**	**0.0000**	**66.6022**	**66.6022**	**3.6700e-003**	**0.0000**	**66.6939**

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					0.0284	0.0000	0.0284	0.0145	0.0000	0.0145	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0195	0.2086	0.1527	3.0000e-004		9.4100e-003	9.4100e-003		8.6600e-003	8.6600e-003	0.0000	26.0547	26.0547	8.4300e-003	0.0000	26.2654
Total	**0.0195**	**0.2086**	**0.1527**	**3.0000e-004**	**0.0284**	**9.4100e-003**	**0.0379**	**0.0145**	**8.6600e-003**	**0.0231**	**0.0000**	**26.0547**	**26.0547**	**8.4300e-003**	**0.0000**	**26.2654**

3.4 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	5.1300e-003	0.1917	0.0326	6.8000e-004	0.0147	4.8000e-004	0.0152	4.0700e-003	4.6000e-004	4.5300e-003	0.0000	65.6280	65.6280	3.6400e-003	0.0000	65.7191
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	5.1000e-004	3.6000e-004	3.7800e-003	1.0000e-005	1.1500e-003	1.0000e-005	1.1500e-003	3.1000e-004	1.0000e-005	3.1000e-004	0.0000	0.9742	0.9742	3.0000e-005	0.0000	0.9749
Total	**5.6400e-003**	**0.1920**	**0.0364**	**6.9000e-004**	**0.0159**	**4.9000e-004**	**0.0164**	**4.3800e-003**	**4.7000e-004**	**4.8400e-003**	**0.0000**	**66.6022**	**66.6022**	**3.6700e-003**	**0.0000**	**66.6939**

3.5 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	0.1450	1.3273	1.3909	2.2900e-003		0.0688	0.0688		0.0647	0.0647	0.0000	196.9665	196.9665	0.0472	0.0000	198.1462
Total	**0.1450**	**1.3273**	**1.3909**	**2.2900e-003**		**0.0688**	**0.0688**		**0.0647**	**0.0647**	**0.0000**	**196.9665**	**196.9665**	**0.0472**	**0.0000**	**198.1462**

3.5 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	9.2500e-003	0.3424	0.0683	1.0000e-003	0.0244	5.4000e-004	0.0249	7.0300e-003	5.2000e-004	7.5500e-003	0.0000	95.8354	95.8354	6.1000e-003	0.0000	95.9879
Worker	0.0317	0.0220	0.2333	6.7000e-004	0.0747	4.9000e-004	0.0752	0.0198	4.5000e-004	0.0203	0.0000	60.1733	60.1733	1.6100e-003	0.0000	60.2135
Total	**0.0410**	**0.3644**	**0.3016**	**1.6700e-003**	**0.0990**	**1.0300e-003**	**0.1001**	**0.0269**	**9.7000e-004**	**0.0278**	**0.0000**	**156.0088**	**156.0088**	**7.7100e-003**	**0.0000**	**156.2014**

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	0.1450	1.3273	1.3909	2.2900e-003		0.0688	0.0688		0.0647	0.0647	0.0000	196.9662	196.9662	0.0472	0.0000	198.1459
Total	**0.1450**	**1.3273**	**1.3909**	**2.2900e-003**		**0.0688**	**0.0688**		**0.0647**	**0.0647**	**0.0000**	**196.9662**	**196.9662**	**0.0472**	**0.0000**	**198.1459**

3.5 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	9.2500e-003	0.3424	0.0683	1.0000e-003	0.0233	5.4000e-004	0.0239	6.7800e-003	5.2000e-004	7.3000e-003	0.0000	95.8354	95.8354	6.1000e-003	0.0000	95.9879
Worker	0.0317	0.0220	0.2333	6.7000e-004	0.0708	4.9000e-004	0.0713	0.0189	4.5000e-004	0.0193	0.0000	60.1733	60.1733	1.6100e-003	0.0000	60.2135
Total	**0.0410**	**0.3644**	**0.3016**	**1.6700e-003**	**0.0941**	**1.0300e-003**	**0.0952**	**0.0257**	**9.7000e-004**	**0.0266**	**0.0000**	**156.0088**	**156.0088**	**7.7100e-003**	**0.0000**	**156.2014**

3.6 Paving - 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	0.0276	0.2781	0.3645	5.7000e-004		0.0142	0.0142		0.0131	0.0131	0.0000	50.0689	50.0689	0.0162	0.0000	50.4737
Paving	7.5700e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0351**	**0.2781**	**0.3645**	**5.7000e-004**		**0.0142**	**0.0142**		**0.0131**	**0.0131**	**0.0000**	**50.0689**	**50.0689**	**0.0162**	**0.0000**	**50.4737**

3.6 Paving - 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	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	1.2800e-003	8.9000e-004	9.4400e-003	3.0000e-005	3.0200e-003	2.0000e-005	3.0400e-003	8.0000e-004	2.0000e-005	8.2000e-004	0.0000	2.4355	2.4355	6.0000e-005	0.0000	2.4371
Total	**1.2800e-003**	**8.9000e-004**	**9.4400e-003**	**3.0000e-005**	**3.0200e-003**	**2.0000e-005**	**3.0400e-003**	**8.0000e-004**	**2.0000e-005**	**8.2000e-004**	**0.0000**	**2.4355**	**2.4355**	**6.0000e-005**	**0.0000**	**2.4371**

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	0.0276	0.2781	0.3645	5.7000e-004		0.0142	0.0142		0.0131	0.0131	0.0000	50.0688	50.0688	0.0162	0.0000	50.4737
Paving	7.5700e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0351**	**0.2781**	**0.3645**	**5.7000e-004**		**0.0142**	**0.0142**		**0.0131**	**0.0131**	**0.0000**	**50.0688**	**50.0688**	**0.0162**	**0.0000**	**50.4737**

3.6 Paving - 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	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	1.2800e-003	8.9000e-004	9.4400e-003	3.0000e-005	2.8600e-003	2.0000e-005	2.8800e-003	7.6000e-004	2.0000e-005	7.8000e-004	0.0000	2.4355	2.4355	6.0000e-005	0.0000	2.4371
Total	**1.2800e-003**	**8.9000e-004**	**9.4400e-003**	**3.0000e-005**	**2.8600e-003**	**2.0000e-005**	**2.8800e-003**	**7.6000e-004**	**2.0000e-005**	**7.8000e-004**	**0.0000**	**2.4355**	**2.4355**	**6.0000e-005**	**0.0000**	**2.4371**

3.7 Architectural Coating - 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					
Archit. Coating	0.2075					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.1400e-003	0.0423	0.0544	9.0000e-005		2.4500e-003	2.4500e-003		2.4500e-003	2.4500e-003	0.0000	7.6598	7.6598	5.0000e-004	0.0000	7.6722
Total	**0.2137**	**0.0423**	**0.0544**	**9.0000e-005**		**2.4500e-003**	**2.4500e-003**		**2.4500e-003**	**2.4500e-003**	**0.0000**	**7.6598**	**7.6598**	**5.0000e-004**	**0.0000**	**7.6722**

3.7 Architectural Coating - 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	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	2.2600e-003	1.5700e-003	0.0166	5.0000e-005	5.3200e-003	3.0000e-005	5.3500e-003	1.4100e-003	3.0000e-005	1.4400e-003	0.0000	4.2865	4.2865	1.1000e-004	0.0000	4.2894
Total	**2.2600e-003**	**1.5700e-003**	**0.0166**	**5.0000e-005**	**5.3200e-003**	**3.0000e-005**	**5.3500e-003**	**1.4100e-003**	**3.0000e-005**	**1.4400e-003**	**0.0000**	**4.2865**	**4.2865**	**1.1000e-004**	**0.0000**	**4.2894**

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					
Archit. Coating	0.2075					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.1400e-003	0.0423	0.0544	9.0000e-005		2.4500e-003	2.4500e-003		2.4500e-003	2.4500e-003	0.0000	7.6598	7.6598	5.0000e-004	0.0000	7.6722
Total	**0.2137**	**0.0423**	**0.0544**	**9.0000e-005**		**2.4500e-003**	**2.4500e-003**		**2.4500e-003**	**2.4500e-003**	**0.0000**	**7.6598**	**7.6598**	**5.0000e-004**	**0.0000**	**7.6722**

3.7 Architectural Coating - 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	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	2.2600e-003	1.5700e-003	0.0166	5.0000e-005	5.0400e-003	3.0000e-005	5.0800e-003	1.3400e-003	3.0000e-005	1.3800e-003	0.0000	4.2865	4.2865	1.1000e-004	0.0000	4.2894
Total	**2.2600e-003**	**1.5700e-003**	**0.0166**	**5.0000e-005**	**5.0400e-003**	**3.0000e-005**	**5.0800e-003**	**1.3400e-003**	**3.0000e-005**	**1.3800e-003**	**0.0000**	**4.2865**	**4.2865**	**1.1000e-004**	**0.0000**	**4.2894**

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	0.7867	10.0394	8.6249	0.0513	2.8516	0.0248	2.8765	0.7664	0.0233	0.7897	0.0000	4,826.8161	4,826.8161	0.2821	0.0000	4,833.8690
Unmitigated	0.7867	10.0394	8.6249	0.0513	2.8516	0.0248	2.8765	0.7664	0.0233	0.7897	0.0000	4,826.8161	4,826.8161	0.2821	0.0000	4,833.8690

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Convenience Market With Gas Pumps	2,179.02	2,179.02	2179.02	5,804,039	5,804,039
Fast Food Restaurant with Drive Thru	304.99	304.99	304.99	815,782	815,782
Gasoline/Service Station	288.00	288.00	288.00	769,886	769,886
Other Asphalt Surfaces	0.00	0.00	0.00		
Total	2,772.00	2,772.00	2,772.00	7,389,707	7,389,707

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
Convenience Market With Gas	9.50	7.30	7.30	0.80	80.20	19.00	100	0	0
Fast Food Restaurant with Drive	9.50	7.30	7.30	2.20	78.80	19.00	100	0	0
Gasoline/Service Station	9.50	7.30	7.30	2.00	79.00	19.00	100	0	0
Other Asphalt Surfaces	9.50	7.30	7.30	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
Convenience Market With Gas Pumps	0.555935	0.035798	0.180985	0.113549	0.015175	0.004939	0.018497	0.064736	0.001364	0.001528	0.005807	0.000803	0.000884
Fast Food Restaurant with Drive Thru	0.555935	0.035798	0.180985	0.113549	0.015175	0.004939	0.018497	0.064736	0.001364	0.001528	0.005807	0.000803	0.000884
Gasoline/Service Station	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Other Asphalt Surfaces	0.555935	0.035798	0.180985	0.113549	0.015175	0.004939	0.018497	0.064736	0.001364	0.001528	0.005807	0.000803	0.000884

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	73.7657	73.7657	3.0500e-003	6.3000e-004	74.0296
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	73.7657	73.7657	3.0500e-003	6.3000e-004	74.0296
NaturalGas Mitigated	4.6900e-003	0.0426	0.0358	2.6000e-004		3.2400e-003	3.2400e-003		3.2400e-003	3.2400e-003	0.0000	46.4241	46.4241	8.9000e-004	8.5000e-004	46.6999
NaturalGas Unmitigated	4.6900e-003	0.0426	0.0358	2.6000e-004		3.2400e-003	3.2400e-003		3.2400e-003	3.2400e-003	0.0000	46.4241	46.4241	8.9000e-004	8.5000e-004	46.6999

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					
Convenience Market With Gas Pumps	13548.7	7.0000e-005	6.6000e-004	5.6000e-004	0.0000		5.0000e-005	5.0000e-005		5.0000e-005	5.0000e-005	0.0000	0.7230	0.7230	1.0000e-005	1.0000e-005	0.7273
Fast Food Restaurant with Drive Thru	815125	4.4000e-003	0.0400	0.0336	2.4000e-004		3.0400e-003	3.0400e-003		3.0400e-003	3.0400e-003	0.0000	43.4982	43.4982	8.3000e-004	8.0000e-004	43.7566
Gasoline/Service Station	41280.8	2.2000e-004	2.0200e-003	1.7000e-003	1.0000e-005		1.5000e-004	1.5000e-004		1.5000e-004	1.5000e-004	0.0000	2.2029	2.2029	4.0000e-005	4.0000e-005	2.2160
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		**4.6900e-003**	**0.0426**	**0.0358**	**2.5000e-004**		**3.2400e-003**	**3.2400e-003**		**3.2400e-003**	**3.2400e-003**	**0.0000**	**46.4241**	**46.4241**	**8.8000e-004**	**8.5000e-004**	**46.6999**

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	tons/yr										MT/yr					
Convenience Market With Gas Pumps	13548.7	7.0000e-005	6.6000e-004	5.6000e-004	0.0000		5.0000e-005	5.0000e-005		5.0000e-005	5.0000e-005	0.0000	0.7230	0.7230	1.0000e-005	1.0000e-005	0.7273
Fast Food Restaurant with Drive Thru	815125	4.4000e-003	0.0400	0.0336	2.4000e-004		3.0400e-003	3.0400e-003		3.0400e-003	3.0400e-003	0.0000	43.4982	43.4982	8.3000e-004	8.0000e-004	43.7566
Gasoline/Service Station	41280.8	2.2000e-004	2.0200e-003	1.7000e-003	1.0000e-005		1.5000e-004	1.5000e-004		1.5000e-004	1.5000e-004	0.0000	2.2029	2.2029	4.0000e-005	4.0000e-005	2.2160
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		**4.6900e-003**	**0.0426**	**0.0358**	**2.5000e-004**		**3.2400e-003**	**3.2400e-003**		**3.2400e-003**	**3.2400e-003**	**0.0000**	**46.4241**	**46.4241**	**8.8000e-004**	**8.5000e-004**	**46.6999**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Convenience Market With Gas Pumps	77080.9	24.5596	1.0100e-003	2.1000e-004	24.6475
Fast Food Restaurant with Drive Thru	141538	45.0970	1.8600e-003	3.9000e-004	45.2583
Gasoline/Service Station	12896.3	4.1090	1.7000e-004	4.0000e-005	4.1237
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**73.7657**	**3.0400e-003**	**6.4000e-004**	**74.0296**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Convenience Market With Gas Pumps	77080.9	24.5596	1.0100e-003	2.1000e-004	24.6475
Fast Food Restaurant with Drive Thru	141538	45.0970	1.8600e-003	3.9000e-004	45.2583
Gasoline/Service Station	12896.3	4.1090	1.7000e-004	4.0000e-005	4.1237
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**73.7657**	**3.0400e-003**	**6.4000e-004**	**74.0296**

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	0.0777	2.0000e-005	2.4800e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.8200e-003	4.8200e-003	1.0000e-005	0.0000	5.1400e-003
Unmitigated	0.0777	2.0000e-005	2.4800e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.8200e-003	4.8200e-003	1.0000e-005	0.0000	5.1400e-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	0.0208					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0567					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.3000e-004	2.0000e-005	2.4800e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.8200e-003	4.8200e-003	1.0000e-005	0.0000	5.1400e-003
Total	**0.0777**	**2.0000e-005**	**2.4800e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**4.8200e-003**	**4.8200e-003**	**1.0000e-005**	**0.0000**	**5.1400e-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	0.0208					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0567					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.3000e-004	2.0000e-005	2.4800e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	4.8200e-003	4.8200e-003	1.0000e-005	0.0000	5.1400e-003
Total	**0.0777**	**2.0000e-005**	**2.4800e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**4.8200e-003**	**4.8200e-003**	**1.0000e-005**	**0.0000**	**5.1400e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

Use Water Efficient Irrigation System

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	6.6291	0.0387	9.6000e-004	7.8841
Unmitigated	8.0355	0.0484	1.2000e-003	9.6033

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Convenience Market With Gas Pumps	0.451842 / 0.276936	2.9983	0.0148	3.7000e-004	3.4802
Fast Food Restaurant with Drive Thru	0.90453 / 0.057736	4.2440	0.0296	7.3000e-004	5.2024
Gasoline/Service Station	0.119537 / 0.0732646	0.7932	3.9300e-003	1.0000e-004	0.9207
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**8.0355**	**0.0484**	**1.2000e-003**	**9.6033**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Convenience Market With Gas Pumps	0.361474 / 0.260043	2.5349	0.0119	3.0000e-004	2.9209
Fast Food Restaurant with Drive Thru	0.723624 / 0.0542141	3.4236	0.0237	5.8000e-004	4.1905
Gasoline/Service Station	0.0956296 / 0.0687955	0.6706	3.1400e-003	8.0000e-005	0.7727
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**6.6291**	**0.0387**	**9.6000e-004**	**7.8841**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	11.6740	0.6899	0.0000	28.9219
Unmitigated	11.6740	0.6899	0.0000	28.9219

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Convenience Market With Gas Pumps	18.33	3.7208	0.2199	0.0000	9.2182
Fast Food Restaurant with Drive Thru	34.33	6.9687	0.4118	0.0000	17.2646
Gasoline/Service Station	4.85	0.9845	0.0582	0.0000	2.4391
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**11.6740**	**0.6899**	**0.0000**	**28.9219**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Convenience Market With Gas Pumps	18.33	3.7208	0.2199	0.0000	9.2182
Fast Food Restaurant with Drive Thru	34.33	6.9687	0.4118	0.0000	17.2646
Gasoline/Service Station	4.85	0.9845	0.0582	0.0000	2.4391
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**11.6740**	**0.6899**	**0.0000**	**28.9219**

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 H – Hydrology Report

HYDROLOGY REPORT

Victorville Nisqualli

NWC of Mariposa Road and Nasqualli Road
Victorville, CA 92395
APN: 3092-311-09 and 3092-311-10

January 2021

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KHA Project # 195274001

TABLE OF CONTENTS

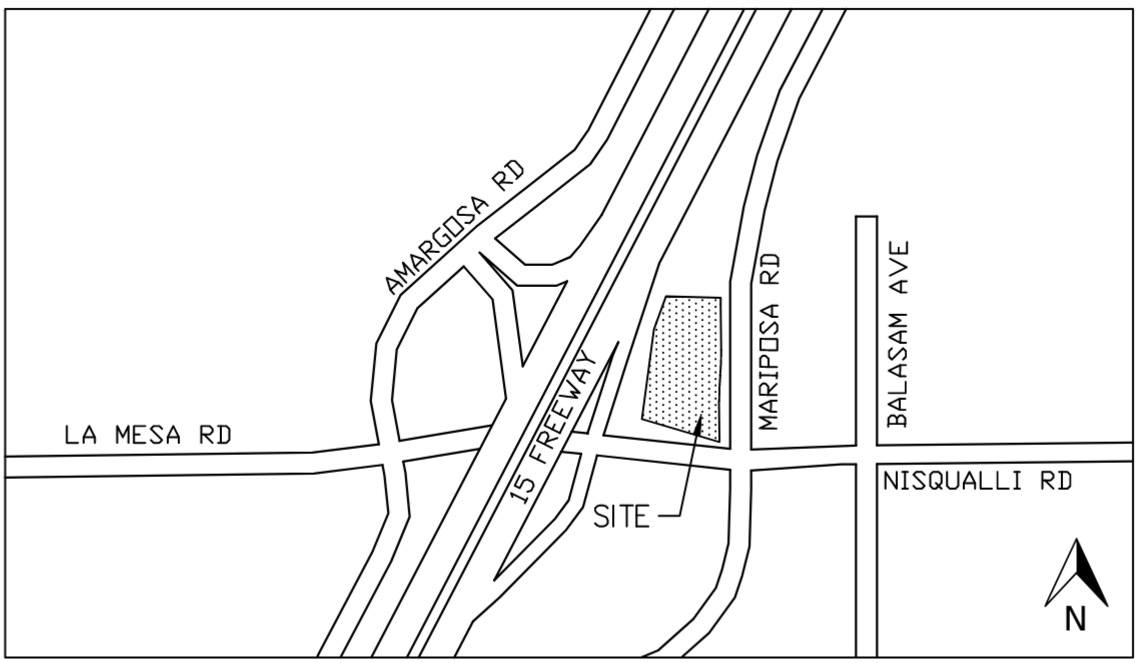
DRAINAGE ANALYSIS

Victorville Nisqualli
Victorville, CA

INTRODUCTION

Kimley-Horn and Associates has been retained to prepare a Hydrology Report for the proposed Maverick C-Store and gas pumps. The proposed project is located at the northwest corner of Nisqualli Road and Mariposa Road in the City of Victorville, County of San Bernardino, California. The assessor's parcel numbers for the project site is 3092-311-09 and 3092-311-10. **Figure 1-1** below contains an aerial photograph that depicts the project location.

Figure 1-1 Project location



The proposed project consists of a 6,112 square foot C-store, a fueling canopy for automobiles, a fueling canopy for trucks, and associated fueling appurtenances, landscaping, concrete hardscape, and asphalt paving. The associated improvements include, but are not limited to onsite and offsite grading, domestic water service, sanitary sewer service, storm drain infrastructure, street improvements, concrete and asphalt pavement, landscaping and irrigation. The proposed development is approximately 5.13 acres. The proposed building use will be commercial, as it will contain a restaurant and other truck stop facilities. The site is currently undeveloped and is 100% pervious. Once the site is developed the site will be 24% pervious and 76% impervious.

This Hydrology Report is intended to comply with the requirements of the San Bernardino Hydrology Manual. The purpose of this report is to demonstrate the analysis of the hydrologic and hydraulic conditions associated with the proposed development of the project site. Due to the nature of the project, this report will be accompanied by a WQMP.

The report includes the proposed condition hydrologic analysis, and sizing for the underground StormTrap underground infiltration system. The proposed underground system will utilize infiltration to meet treatment criteria for the proposed development to be incompliance with current NPDES General Permit. The proposed site will be a zero-discharge site. Currently there is three (3) existing culverts located on the southern property line of the site that discharge onto the site. The existing offsite flows are intercepted by an existing Caltrans drainage channel and is diverted around the site until it is discharged north of the site. All drive aisles and drainage conveyance devices will be designed to convey the storm flows to historic storm conveyance.

Due to the project site being a retail gasoline outlet, the project will require a WQMP along with a Maintenance Agreement and Transfer (Per Planning Priority Project Checklist). Even though this report discusses stormwater, this report is not a Stormwater Pollution Prevention Plan (SWPPP), a Groundwater Study, a Geotechnical Report, nor a Water Quality Management Plan (WQMP). Each of these separate reports discusses separate aspects of stormwater. Portions of the Geotechnical Report are utilized and referenced for the purpose of this report. Similarly, the requirements of the WQMP are considered for the stormwater mitigation and sizing of outlet structures for this project.

This study was performed using the following reference materials and tools:

- San Bernardino County Hydrology Manual
- Rational Method Hydrology Computer Program (Hydrowin)
- NRCS-USDA Web Soil Survey

SITE DISCUSSION

The site is currently undeveloped and fully pervious. The existing site generally sheet flows northerly direction and is eventually collected in earthen swales that discharge north of the project site. Three existing Caltrans owned culverts discharge on the south side of the project area. In general, this run-on drainage from these culverts are intercepted in an existing Caltrans drainage channel along the project's south and west perimeter. There are no other existing drainage structures onsite. Refer to **Appendix B** for a visual layout of the existing site conditions.

The proposed project is a standalone project that will develop the existing site into a C-store with gas pumps for automobiles and trucks. The proposed C-store with gas pumps will feature a restaurant, fueling pumps for automobiles, fueling pumps for trucks, an air compressor, a truck dump, and a truck scale. The proposed development will feature one main structure that will be approximately 6,112 square feet. There will be regular parking stalls for both employee and customers. Daily routine site activities will consist of customers entering the site to fuel their automobiles or trucks and entering the C-store for food and snacks. A covered trash enclosure will be provided. The site will be landscaped around the entire perimeter. Landscape will include a variety of trees, shrubs, and ground covered of native species.

The undeveloped site is approximately 100% impervious. Once developed the site will be approximately 76% impervious and 24% pervious.

RAINFALL DATA/SOIL DATA

Per the 2010 San Bernardino County Hydrology Manual Addendum, arid regions within San Bernardino County should use NOAA Atlas 14 rainfall atlas and the associated data base (NOAA, 2006) or other local rainfall gauge data for hydrology studies. After review of available data, included Department of Water Resources rain data, the NOAA Atlas 14 rainfall data was chosen for this study due to the proximity of the nearest gage to the site. NOAA Atlas 14 also provides information for the various peak durations required to complete the hydrology analysis for the current study.

According to NOAA Atlas 14, the following are the 24 hour-storm precipitation values that have been utilized for our study:

10-year storm 24-hour intensity (inch/hour) =	0.109
100-year storm 24-hour intensity (inch/hour) =	0.188

Appendix A contains the site-specific tabular output from NOAA Atlas 14.

The type of soil and soil conditions are major factors affecting infiltration/detention and resultant storm water runoff. The Natural Resources Conservation Service (NRCS) has classified soil into one general hydrologic soil groups for comparing infiltration and runoff rates. Each group is based on properties that influence runoff, such as water infiltration rate, texture, natural discharge and moisture condition. The runoff potential is based on the amount of runoff at the end of a long duration storm that occurs after wetting and swelling of the soil not protected by vegetation. Using the United States

Department of Agriculture Natural Resources Conservation Service Web Soil Survey online tool and the Stormwater Facility Mapping online tool for Riverside County, it was determined the hydrologic soil group classification is A. Soil group A is defined as soils having good infiltration rates (low runoff potential). These soils have a good rate of water transmission. Based on the Geotechnical Investigation from CMT Engineering Laboratories dated September 10, 2020 it was concluded that the site has good infiltration capacity. The measured infiltration rate for the site was determined to be 1.5 min/in (40 in/hr).

See **Appendix D** for Web Soil Survey and Geotechnical Investigation Report.

In addition, antecedent moisture condition (AMC) II was used to calculate the 10-year and AMC III for the 100-year peak flows based on the 2010 San Bernardino County Hydrology Manual Addendum. The land use for the existing drainage areas was selected as natural barren, based on the existing conditions. The land use for the proposed drainage areas were selected based on the percent of pervious area for each of the drainage areas, as shown on Table 1. The combination of the soil and coverage type was used as the basis for selecting the appropriate curve numbers used to calculate the soil loss rates. The total drainage area that drains to the proposed underground infiltration system is approximately 86% impervious and was used in AES to calculate the soil loss rates used in the synthetic unit hydrograph calculations. See Appendix A Figure C-4 for curve numbers based on hydrologic soil conditions for pervious areas.

Table 1: Drainage Area Pervious Percentages

Drainage Area	Drainage Area (AC)	Percent Pervious (%)
DA-A	0.68	79
DA-B	3.95	87
DA-C	0.33	100
DA-D	0.05	0
DA-E	0.23	100

Note: Final design criteria will be determined by Geotech review of percolation/infiltration rate testing prior to final engineering design. Percolation/Infiltration rate testing is recommended.

ON-SITE DRAINAGE

A Rational method analysis for the 10-year and 100-year events in accordance with the San Bernardino Hydrology Manual (SBC, 1986) and the 2010 Addendum was completed to calculate the peak discharges for the proposed project conditions. A review of Natural Resources Conservation Service Soil Survey Maps showed that the existing soils consisted of hydrologic group A. Soil group A is defined as soils having high infiltration rates (low runoff potential) when thoroughly wetted. These soils have a good rate of water transmission. The combination of the soil and coverage type was used as the basis for selecting the appropriate curve numbers used to calculate the soil loss rate. See **Appendix A** Figure C-2 and C-3 for curve numbers based on hydrologic soil conditions for pervious areas.

In addition, antecedent moisture condition (AMC) II was used to calculate the 10-year and AMC III or the100-year peak flows based on the AMC map (Figure ADD-1) published with the 2010 addendum. The land use for the drainage area was selected based on the percent pervious that represents the area for the proposed conditions. The Advance Engineering Software (AES) Hydrosoft package was used to complete the rational method analysis. The results of the rational method analysis are included in **Appendix B and C**.

The proposed site consists of five (5) drainage areas, in which two (2) areas are self-treating areas (DA C and DA E), and one (1) area is a de minims area (DA D). See **Appendix C** for a visual reference of the location of the drainage areas. For the proposed condition, drainage from DA A sheet flows through the parking area and drive aisles before making its way to a curb cut on the southwest corner of the site. Runoff from DA A discharges to an infiltration basin. Drainage from DA B sheet flows through the site making its way to a curb cut at the northeast corner of the site. Runoff from DA B discharges to an infiltration basin. Runoff exceeding the capacity of the infiltration basin will discharge to an underground ADS StormTech MC-4500 infiltration system.

The analysis in **Appendix C** establishes the contributing flows to each drainage area. The proposed conditions drainage map and full output from the proposed conditions hydrology AES models are provided in **Appendix C**. A summary of the proposed conditions peak flow is shown in Table 2.

Table 2: Proposed Hydrology Results

Drainage Area ID	Drainage Area (AC)	Q_{10} (cfs)	Q_{100} (cfs)
A	0.68	1.20	2.14
B	3.95	6.97	12.14
C	0.33	Self-treating	
D	0.05	De Minims	
E	0.23	Self-treating	

** Refer to **Appendix C** for the AES output.*

All three infiltration systems were designed to have a maximum drawdown time of 48 hours as shown in **Appendix C**. Additionally, the required design capture volume is 10,595 ft^3 per the project specific WQMP.

STORMWATER TREATMENT

Three infiltration systems are proposed for the site. Runoff from DA A will be treated and retained in an infiltration basin located near the southwest corner of the site. Runoff from DA B will be treated and retained in an infiltration basin located along the northern perimeter of the site and an underground ADS StormTech MC-4500 infiltration system.

Per the Geotechnical Report, measured infiltration rates of 40 in/hr were encountered at the site; therefore, infiltration BMPs are feasible. The proposed underground infiltration system was sized to treat the design capture the volume (DCV), as outlined in the WQMP, and to retain the storm water volume required to not create adverse impacts downstream. The required DCV for DA A is 1371 c.f. and the required DCV for DA B is 9224 c.f. Each infiltration system has been sized to treat and retain the 100-year storm event; therefore, enough capacity has been provided to retain the DCV.

Storm water facilities require routine maintenance to operate efficiently. It is recommended that facilities be inspected prior to the rainy season (fall) and after each runoff producing storm event. The infiltration basins, ADS StormTech MC-4500 infiltration system, overflow systems shall be routinely inspected and sediment/debris build up shall be removed to maintain efficient operation of the storm water facilities. See the projects WQMP for the proposed Operation and Maintenance Plan.

Each infiltration system will be designed to detain and treat the hydromodification volumes for each drainage area per the Mojave River Watershed Water Quality Management Plan Guidelines during final engineering. A drainage map is included in **Appendix C** for a visual reference of the location of the proposed storm drain facilities.

CONCLUSION

The development of the existing vacant site into the proposed C-store with gas pumps for automobiles and trucks will not create any adverse impacts downstream by not increasing storm water peak flow rates and volumes discharging from the site under the existing condition. Instead the site will be a zero-discharge site in both the 10-year and 100-year storm events through the retention of the 100-year volume in the proposed infiltration basins and underground ADS StormTech MC-4500 infiltration system. Under the proposed development, the infiltration systems for each drainage area will be able to attenuate peak flows, detain storm water volumes, and provide water quality treatment. Conservative assumptions were used in sizing the proposed infiltration systems.

APPENDIX A

- City Priority Checklist
- APN Map
- NOAA Atlas 14 Rainfall Data
- San Bernardino County Hydrology Manual
  - Figure C-3, C-4, and C-6; and Pages C-9 and C-10
- Site Design BMP’s
- Mojave River Watershed

STORM WATER PROGRAM
PLANNING PRIORITY PROJECT CHECKLIST

Project Name Victorville Nisqualli
Project Address APN 3092-311-09 and 3092-311-10
Developer Name Paul Heywood
Developer Address 185 South State Street, Suite 800 Salt Lake City, UT 84111
Developer Phone 801-574-4449
Owner Name
Owner Address
Owner Phone

Part 1 - Project Type	YES	NO
1. 10 or more unit homes, including single and multiple family homes, condominiums,		X
2. An Industrial or commercial development with 100,000+ SF of impervious surface	X	
3. An automotive service facility - (5,000 SF or more)		X
4. A retail gasoline outlet - (5,000 SF or more)	X	
5. A restaurant (5,000 SF or more)		X
6. A parking lot with either 5,000 SF of impervious surface or with 25 or more parking spaces	X	
7. A single family hillside dwelling (one acre or more surface area)		X
8. Redevelopment projects		X
9. Project location in, adjacent to or discharging directly to an ESA (as defined on back) AND creates 2,500 SF or more of impervious surface area.		X

If any of the boxes in Part 1 is checked "yes", this project will require a WQMP along with a Maintenance Agreement and Transfer

Part 2 - Project Specific Concerns/Characters	YES	NO
1. A single family hillside dwelling (less than one acre) - WQMP required		X
2. An automotive service facility (less than 5,000 SF or more) - WQMP required		X
3. a retail gasoline outlet (less than 5,000 SF or more) - WQMP required		X
4. A restaurant (less than 5,000 SF or more) WQMP required		X
5. Vehicle or equipment fueling areas (retail or private)	X	
6. Commercial or Industrial waste handling or storage		X
7. Outdoor handling or storage of hazardous waste materials		X
8. Outdoor manufacturing areas		X
9. Outdoor food handling or processing		X
10. Outdoor animal care, confinement or slaughter		X
11. Outdoor horticulture activities		X

If any of the boxes in Part 2 is checked "yes", this project will require a WQMP along with a Maintenance Agreement and Transfer

Applicant Signature Print Name Title Date

NOAA Atlas 14, Volume 6, Version 2
Location name: Victorville, California, USA*
Latitude: 34.4859°, Longitude: -117.333°
Elevation: 3062.99 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	**0.087** (0.072-0.106)	**0.123** (0.101-0.150)	**0.171** (0.141-0.210)	**0.211** (0.173-0.262)	**0.268** (0.212-0.343)	**0.313** (0.242-0.409)	**0.360** (0.272-0.482)	**0.409** (0.301-0.563)	**0.479** (0.337-0.687)	**0.534** (0.364-0.793)
10-min	**0.125** (0.103-0.152)	**0.176** (0.145-0.215)	**0.245** (0.202-0.301)	**0.303** (0.247-0.375)	**0.384** (0.303-0.492)	**0.449** (0.347-0.586)	**0.516** (0.389-0.690)	**0.587** (0.431-0.807)	**0.686** (0.483-0.984)	**0.766** (0.521-1.14)
15-min	**0.151** (0.125-0.184)	**0.213** (0.176-0.261)	**0.297** (0.244-0.364)	**0.367** (0.299-0.454)	**0.465** (0.367-0.594)	**0.542** (0.420-0.708)	**0.624** (0.471-0.835)	**0.710** (0.521-0.976)	**0.830** (0.584-1.19)	**0.926** (0.630-1.38)
30-min	**0.216** (0.178-0.264)	**0.304** (0.251-0.373)	**0.424** (0.349-0.521)	**0.524** (0.428-0.649)	**0.665** (0.525-0.850)	**0.776** (0.600-1.01)	**0.892** (0.673-1.19)	**1.01** (0.745-1.40)	**1.19** (0.836-1.70)	**1.32** (0.901-1.97)
60-min	**0.274** (0.226-0.335)	**0.387** (0.319-0.473)	**0.539** (0.444-0.661)	**0.666** (0.544-0.824)	**0.844** (0.667-1.08)	**0.985** (0.762-1.29)	**1.13** (0.855-1.52)	**1.29** (0.946-1.77)	**1.51** (1.06-2.16)	**1.68** (1.15-2.50)
2-hr	**0.385** (0.318-0.471)	**0.520** (0.429-0.637)	**0.705** (0.580-0.865)	**0.861** (0.703-1.07)	**1.08** (0.855-1.38)	**1.26** (0.975-1.65)	**1.45** (1.09-1.94)	**1.65** (1.21-2.27)	**1.93** (1.36-2.76)	**2.15** (1.47-3.20)
3-hr	**0.473** (0.391-0.578)	**0.630** (0.520-0.771)	**0.845** (0.696-1.04)	**1.03** (0.840-1.27)	**1.29** (1.02-1.65)	**1.50** (1.16-1.96)	**1.73** (1.30-2.31)	**1.96** (1.44-2.70)	**2.30** (1.62-3.30)	**2.58** (1.75-3.82)
6-hr	**0.646** (0.534-0.789)	**0.853** (0.704-1.04)	**1.14** (0.938-1.40)	**1.39** (1.13-1.71)	**1.74** (1.37-2.22)	**2.02** (1.56-2.64)	**2.33** (1.76-3.11)	**2.65** (1.95-3.65)	**3.12** (2.20-4.47)	**3.50** (2.38-5.20)
12-hr	**0.817** (0.675-0.999)	**1.11** (0.914-1.36)	**1.51** (1.24-1.85)	**1.85** (1.51-2.29)	**2.33** (1.84-2.98)	**2.73** (2.11-3.56)	**3.14** (2.37-4.20)	**3.59** (2.63-4.94)	**4.22** (2.98-6.06)	**4.74** (3.23-7.04)
24-hr	**1.09** (0.966-1.25)	**1.52** (1.35-1.76)	**2.12** (1.87-2.45)	**2.62** (2.29-3.05)	**3.33** (2.82-4.01)	**3.91** (3.24-4.80)	**4.51** (3.66-5.68)	**5.16** (4.07-6.69)	**6.09** (4.60-8.21)	**6.84** (4.99-9.55)
2-day	**1.21** (1.07-1.39)	**1.70** (1.51-1.96)	**2.37** (2.10-2.74)	**2.95** (2.58-3.43)	**3.77** (3.19-4.53)	**4.43** (3.67-5.44)	**5.13** (4.16-6.46)	**5.89** (4.64-7.63)	**6.97** (5.27-9.41)	**7.86** (5.74-11.0)
3-day	**1.30** (1.15-1.50)	**1.83** (1.62-2.11)	**2.56** (2.26-2.96)	**3.18** (2.79-3.70)	**4.07** (3.45-4.90)	**4.79** (3.98-5.89)	**5.56** (4.50-7.00)	**6.39** (5.03-8.27)	**7.58** (5.73-10.2)	**8.55** (6.25-11.9)
4-day	**1.39** (1.24-1.60)	**1.96** (1.73-2.25)	**2.74** (2.42-3.16)	**3.40** (2.98-3.96)	**4.35** (3.68-5.23)	**5.11** (4.24-6.29)	**5.93** (4.81-7.47)	**6.81** (5.37-8.82)	**8.08** (6.11-10.9)	**9.12** (6.66-12.7)
7-day	**1.51** (1.34-1.74)	**2.11** (1.87-2.43)	**2.93** (2.59-3.38)	**3.63** (3.18-4.22)	**4.62** (3.91-5.56)	**5.42** (4.50-6.66)	**6.26** (5.07-7.89)	**7.17** (5.65-9.28)	**8.46** (6.40-11.4)	**9.52** (6.95-13.3)
10-day	**1.61** (1.43-1.85)	**2.23** (1.98-2.57)	**3.09** (2.73-3.57)	**3.82** (3.34-4.45)	**4.85** (4.11-5.84)	**5.68** (4.72-6.98)	**6.56** (5.31-8.26)	**7.49** (5.90-9.71)	**8.83** (6.67-11.9)	**9.91** (7.24-13.8)
20-day	**1.90** (1.69-2.19)	**2.64** (2.34-3.04)	**3.66** (3.23-4.22)	**4.52** (3.96-5.26)	**5.75** (4.87-6.93)	**6.74** (5.60-8.29)	**7.79** (6.31-9.81)	**8.90** (7.01-11.5)	**10.5** (7.92-14.1)	**11.8** (8.58-16.4)
30-day	**2.19** (1.94-2.52)	**3.04** (2.69-3.50)	**4.22** (3.73-4.87)	**5.23** (4.58-6.09)	**6.67** (5.65-8.03)	**7.84** (6.51-9.64)	**9.07** (7.35-11.4)	**10.4** (8.18-13.5)	**12.2** (9.26-16.5)	**13.8** (10.0-19.2)
45-day	**2.57** (2.28-2.95)	**3.54** (3.14-4.08)	**4.92** (4.34-5.68)	**6.11** (5.35-7.11)	**7.83** (6.64-9.43)	**9.23** (7.66-11.4)	**10.7** (8.69-13.5)	**12.3** (9.71-16.0)	**14.6** (11.0-19.7)	**16.4** (12.0-23.0)
60-day	**2.86** (2.53-3.29)	**3.91** (3.47-4.51)	**5.42** (4.79-6.26)	**6.73** (5.90-7.84)	**8.65** (7.33-10.4)	**10.2** (8.50-12.6)	**11.9** (9.66-15.0)	**13.8** (10.8-17.8)	**16.4** (12.4-22.1)	**18.5** (13.5-25.9)

[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
Location name: Victorville, California, USA*
Latitude: 34.4859°, Longitude: -117.333°
Elevation: 3062.99 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/hour)[1]

Duration	Average recurrence interval (years)									
	1	**2**	**5**	**10**	**25**	**50**	**100**	**200**	**500**	**1000**
5-min	**1.04** (0.864-1.27)	**1.48** (1.21-1.80)	**2.05** (1.69-2.52)	**2.53** (2.08-3.14)	**3.22** (2.54-4.12)	**3.76** (2.90-4.91)	**4.32** (3.26-5.78)	**4.91** (3.61-6.76)	**5.75** (4.04-8.24)	**6.41** (4.37-9.52)
10-min	**0.750** (0.618-0.912)	**1.06** (0.870-1.29)	**1.47** (1.21-1.81)	**1.82** (1.48-2.25)	**2.30** (1.82-2.95)	**2.69** (2.08-3.52)	**3.10** (2.33-4.14)	**3.52** (2.59-4.84)	**4.12** (2.90-5.90)	**4.60** (3.13-6.82)
15-min	**0.604** (0.500-0.736)	**0.852** (0.704-1.04)	**1.19** (0.976-1.46)	**1.47** (1.20-1.82)	**1.86** (1.47-2.38)	**2.17** (1.68-2.83)	**2.50** (1.88-3.34)	**2.84** (2.08-3.90)	**3.32** (2.34-4.76)	**3.70** (2.52-5.50)
30-min	**0.432** (0.356-0.528)	**0.608** (0.502-0.746)	**0.848** (0.698-1.04)	**1.05** (0.856-1.30)	**1.33** (1.05-1.70)	**1.55** (1.20-2.03)	**1.78** (1.35-2.39)	**2.03** (1.49-2.79)	**2.37** (1.67-3.40)	**2.65** (1.80-3.93)
60-min	**0.274** (0.226-0.335)	**0.387** (0.319-0.473)	**0.539** (0.444-0.661)	**0.666** (0.544-0.824)	**0.844** (0.667-1.08)	**0.985** (0.762-1.29)	**1.13** (0.855-1.52)	**1.29** (0.946-1.77)	**1.51** (1.06-2.16)	**1.68** (1.15-2.50)
2-hr	**0.192** (0.159-0.236)	**0.260** (0.214-0.318)	**0.352** (0.290-0.432)	**0.430** (0.352-0.532)	**0.541** (0.428-0.692)	**0.630** (0.488-0.823)	**0.724** (0.546-0.968)	**0.823** (0.604-1.13)	**0.964** (0.678-1.38)	**1.08** (0.732-1.60)
3-hr	**0.158** (0.130-0.192)	**0.210** (0.173-0.257)	**0.281** (0.232-0.345)	**0.343** (0.280-0.424)	**0.430** (0.339-0.550)	**0.500** (0.387-0.653)	**0.574** (0.434-0.769)	**0.654** (0.480-0.900)	**0.767** (0.540-1.10)	**0.858** (0.584-1.27)
6-hr	**0.108** (0.089-0.132)	**0.142** (0.118-0.174)	**0.190** (0.157-0.234)	**0.231** (0.189-0.286)	**0.290** (0.229-0.371)	**0.338** (0.261-0.441)	**0.388** (0.293-0.520)	**0.443** (0.325-0.610)	**0.521** (0.367-0.747)	**0.585** (0.398-0.868)
12-hr	**0.068** (0.056-0.083)	**0.092** (0.076-0.112)	**0.125** (0.103-0.154)	**0.153** (0.125-0.190)	**0.194** (0.153-0.248)	**0.226** (0.175-0.295)	**0.261** (0.197-0.349)	**0.298** (0.219-0.410)	**0.351** (0.247-0.503)	**0.394** (0.268-0.584)
24-hr	**0.045** (0.040-0.052)	**0.064** (0.056-0.073)	**0.088** (0.078-0.102)	**0.109** (0.096-0.127)	**0.139** (0.118-0.167)	**0.163** (0.135-0.200)	**0.188** (0.152-0.237)	**0.215** (0.169-0.279)	**0.254** (0.192-0.342)	**0.285** (0.208-0.398)
2-day	**0.025** (0.022-0.029)	**0.035** (0.031-0.041)	**0.049** (0.044-0.057)	**0.061** (0.054-0.072)	**0.078** (0.066-0.094)	**0.092** (0.077-0.113)	**0.107** (0.087-0.135)	**0.123** (0.097-0.159)	**0.145** (0.110-0.196)	**0.164** (0.120-0.229)
3-day	**0.018** (0.016-0.021)	**0.025** (0.022-0.029)	**0.036** (0.031-0.041)	**0.044** (0.039-0.051)	**0.057** (0.048-0.068)	**0.067** (0.055-0.082)	**0.077** (0.063-0.097)	**0.089** (0.070-0.115)	**0.105** (0.080-0.142)	**0.119** (0.087-0.166)
4-day	**0.015** (0.013-0.017)	**0.020** (0.018-0.023)	**0.028** (0.025-0.033)	**0.035** (0.031-0.041)	**0.045** (0.038-0.055)	**0.053** (0.044-0.065)	**0.062** (0.050-0.078)	**0.071** (0.056-0.092)	**0.084** (0.064-0.114)	**0.095** (0.069-0.133)
7-day	**0.009** (0.008-0.010)	**0.013** (0.011-0.014)	**0.017** (0.015-0.020)	**0.022** (0.019-0.025)	**0.027** (0.023-0.033)	**0.032** (0.027-0.040)	**0.037** (0.030-0.047)	**0.043** (0.034-0.055)	**0.050** (0.038-0.068)	**0.057** (0.041-0.079)
10-day	**0.007** (0.006-0.008)	**0.009** (0.008-0.011)	**0.013** (0.011-0.015)	**0.016** (0.014-0.019)	**0.020** (0.017-0.024)	**0.024** (0.020-0.029)	**0.027** (0.022-0.034)	**0.031** (0.025-0.040)	**0.037** (0.028-0.050)	**0.041** (0.030-0.058)
20-day	**0.004** (0.004-0.005)	**0.005** (0.005-0.006)	**0.008** (0.007-0.009)	**0.009** (0.008-0.011)	**0.012** (0.010-0.014)	**0.014** (0.012-0.017)	**0.016** (0.013-0.020)	**0.019** (0.015-0.024)	**0.022** (0.016-0.029)	**0.024** (0.018-0.034)
30-day	**0.003** (0.003-0.004)	**0.004** (0.004-0.005)	**0.006** (0.005-0.007)	**0.007** (0.006-0.008)	**0.009** (0.008-0.011)	**0.011** (0.009-0.013)	**0.013** (0.010-0.016)	**0.014** (0.011-0.019)	**0.017** (0.013-0.023)	**0.019** (0.014-0.027)
45-day	**0.002** (0.002-0.003)	**0.003** (0.003-0.004)	**0.005** (0.004-0.005)	**0.006** (0.005-0.007)	**0.007** (0.006-0.009)	**0.009** (0.007-0.011)	**0.010** (0.008-0.013)	**0.011** (0.009-0.015)	**0.014** (0.010-0.018)	**0.015** (0.011-0.021)
60-day	**0.002** (0.002-0.002)	**0.003** (0.002-0.003)	**0.004** (0.003-0.004)	**0.005** (0.004-0.005)	**0.006** (0.005-0.007)	**0.007** (0.006-0.009)	**0.008** (0.007-0.010)	**0.010** (0.008-0.012)	**0.011** (0.009-0.015)	**0.013** (0.009-0.018)

[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.

Back to Top

PF graphical

Curve (1) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS - Ex Condition					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparral, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparral, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	71	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent.)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	25	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS - Prop. Condition					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		77	86	91	94

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

CURVE NUMBERS FOR PERVIOUS AREAS

Figure C-3 (1 of 2)

Curve (1) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
AGRICULTURAL COVERS (Continued)					
Legumes, Close Seeded	Poor	66	77	85	89
(Alfalfa, sweetclover, timothy, etc.)	Good	58	72	81	85
Orchards, Evergreen	Poor	57	73	82	86
(Citrus, avocados, etc.)	Fair	44	65	77	82
	Good	33	58	72	79
Pasture, Dryland	Poor	68	79	86	89
(Annual grasses)	Fair	49	69	79	84
	Good	39	61	74	80
Pasture, Irrigated	Poor	58	74	83	87
(Legumes and perennial grass)	Fair	44	65	77	82
	Good	33	58	72	79
Row Crops	Poor	72	81	88	91
(Field crops - tomatoes, sugar beets, etc.)	Good	67	78	85	89
Small grain	Poor	65	76	84	88
(Wheat, oats, barley, etc.)	Good	63	75	83	87

Notes:

1. All curve numbers are for Antecedent Moisture Condition (AMC) II.
2. Quality of cover definitions:

   Poor-Heavily grazed, regularly burned areas, or areas of high burn potential. Less than 50 percent of the ground surface is protected by plant cover or brush and tree canopy.

   Fair-Moderate cover with 50 percent to 75 percent of the ground surface protected.

   Good-Heavy or dense cover with more than 75 percent of the ground surface protected.
3. See Figure C-2 for definition of cover types.

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

CURVE NUMBERS FOR PERVIOUS AREAS

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent (2)
Natural or Agriculture	0 - 0	0
Public Park	10 - 25	15
School	30 - 50	40
Single Family Residential: (3)		
2.5 acre lots	5 - 15	10
1 acre lots	10 - 25	20
2 dwellings/acre	20 - 40	30
3-4 dwellings/acre	30 - 50	40
5-7 dwellings/acre	35 - 55	50
8-10 dwellings/acre	50 - 70	60
More than 10 dwellings/acre	65 - 90	80
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 - 100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.

2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area shall always be made, and a review of aerial photos, where available, may assist in estimating the percentage of impervious cover in developed areas.

3. For typical equestrian subdivisions increase impervious area 5 percent over the values recommended in the table above.

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

ACTUAL IMPERVIOUS COVER FOR DEVELOPED AREAS

C.5. ANTECEDENT MOISTURE CONDITION (AMC)

The definitions for the AMC classifications are:

AMC I: Lowest runoff potential. The watershed soils are dry enough to allow satisfactory grading or cultivation to take place.

AMC II: Moderate runoff potential; an average study condition.

AMC III: Highest runoff potential. The watershed is practically saturated from antecedent rains. Heavy rainfall or light rainfall and low temperatures have occurred within the last five days.

For runoff hydrograph studies based on this manual it is assumed that a low AMC index (high loss rates) will be used in developing short return period storms, and a moderate to high AMC index (low loss rates) will be used in developing longer return period storms (e.g., 100 year). For the purposes of design hydrology, AMC I will be used for the 2- and 5-year return frequency storms. For the case of 10-, 25-, 50-year return frequency design storms, AMC II will be used. For 100-year storm analysis, AMC III shall be used. In detention basin design studies, AMC III conditions shall be considered in order to identify any downstream flooding potential.

C.5.1. Adjustment of Curve Numbers (CN) for AMC

The CN values selected for a particular soil cover type and quality also depend upon the AMC condition assumed. The CN values listed in Figure C-3 correspond to AMC II and require adjustment in order to represent either AMC I or AMC III. Table C.1 provides the necessary CN adjustments to account for AMC changes for hydrologic studies in San Bernardino County.

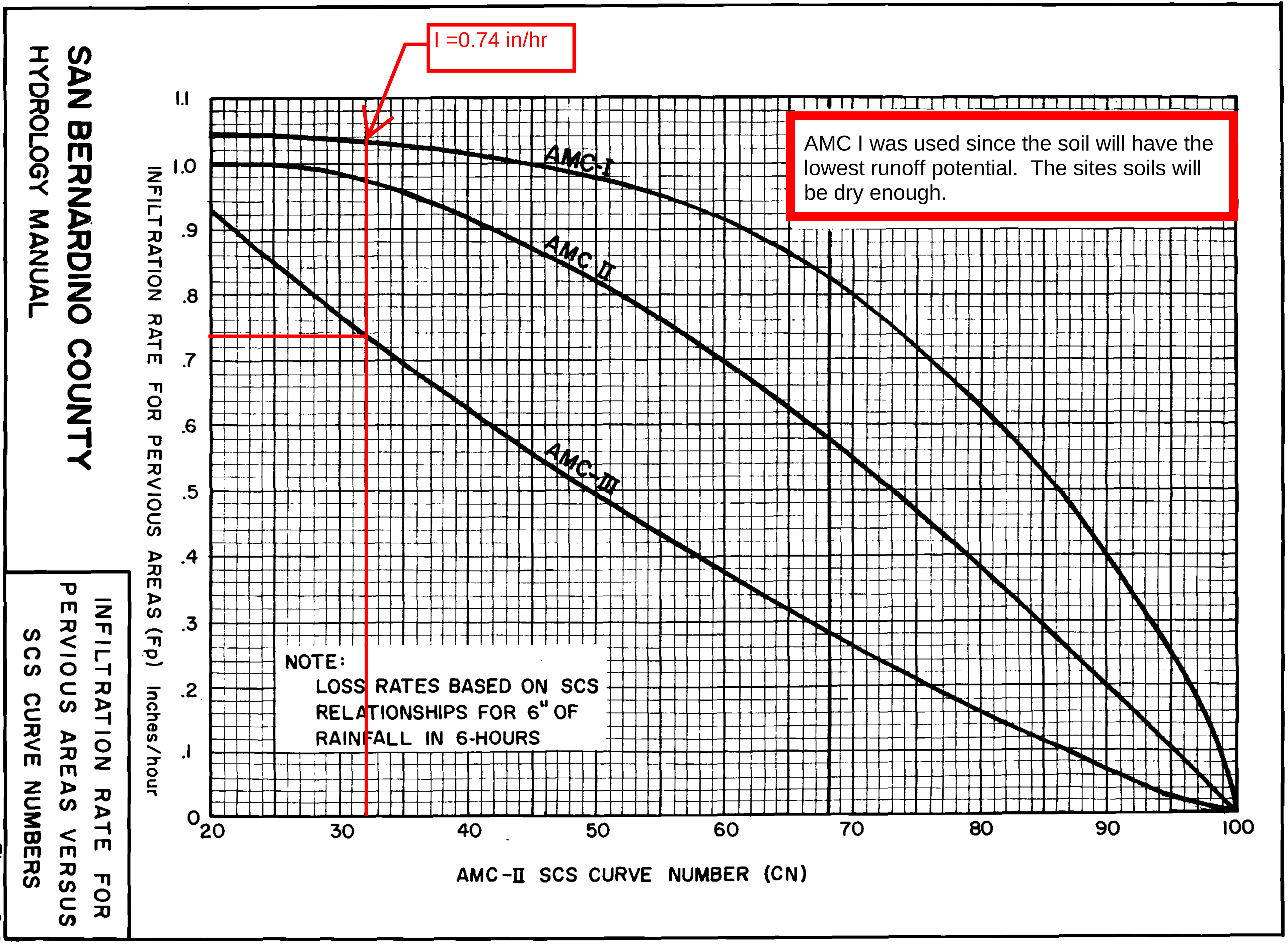
TABLE C.1. CURVE NUMBER RELATIONSHIPS

CN for AMC Condition II	Corresponding CN for AMC Condition I	III
100	100	100
95	87	99
90	78	98
85	70	97
80	63	94
75	57	91
70	51	87
65	45	83
60	40	79
55	35	75
50	31	70
45	27	65
40	23	60
35	19	55
30	15	50
25	12	45
20	9	39
15	7	33
10	4	26
5	2	17
0	0	0

C.6. ESTIMATION OF LOSS RATES

In estimating loss rates for design hydrology, a watershed curve number (CN) is determined for each soil-cover complex within the watershed using Figure C-3. The working range of CN values is between 0 and 98, where a low CN indicates low runoff potential (high infiltration), and a high CN indicates high runoff potential (low infiltration). Selection of a CN takes into account the major factors affecting loss rates on pervious surfaces including the hydrologic soil group, cover type and quality, and antecedent moisture condition (AMC).

Also included in the CN selection are the effects of "initial abstraction" (Ia) which represents the combined effects of other effective rainfall losses including depression storage, vegetation interception, evaporation, and transpiration, among other factors.



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
INFILTRATION RATE FOR PERVIOUS AREAS VERSUS SCS CURVE NUMBERS
I =0.74 in/hr
AMC I was used since the soil will have the lowest runoff potential. The sites soils will be dry enough.
INFILTRATION RATE FOR PERVIOUS AREAS (Fp) Inches/hour
1.1
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
0
AMC-I
AMC II
AMC-III
NOTE:
LOSS RATES BASED ON SCS RELATIONSHIPS FOR 6" OF RAINFALL IN 6-HOURS
20
30
40
50
60
70
80
90
100
AMC-II SCS CURVE NUMBER (CN)

Figure C-6

![StormTech]

MC-4500 CHAMBER

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

STORMTECH MC-4500 CHAMBER

(not to scale)

Nominal Chamber Specifications

Size (L x W x H)
52” x 100” x 60”
1321 mm x 2540 mm x 1524 mm

Chamber Storage
106.5 ft^3 (3.01 m^3)

Min. Installed Storage*
162.6 ft^3 (4.60 m^3)

Weight
Nominal 125 lbs (56.7 kg)

Shipping
7 chambers/pallet
5 end caps/pallet
11 pallets/truck

*Assumes a minimum of 12” (300 mm) of stone above, 9” (230 mm) of stone below chambers, 9” (230 mm) of stone between chambers/end caps and 40% stone porosity.

STORMTECH MC-4500 END CAP

(not to scale)

Nominal End Cap Specifications

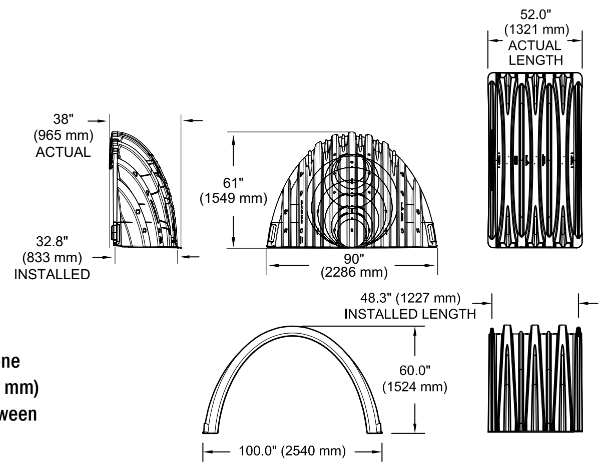
Size (L x W x H)
38” x 90” x 61”
965 mm x 2286 mm x 1549 mm

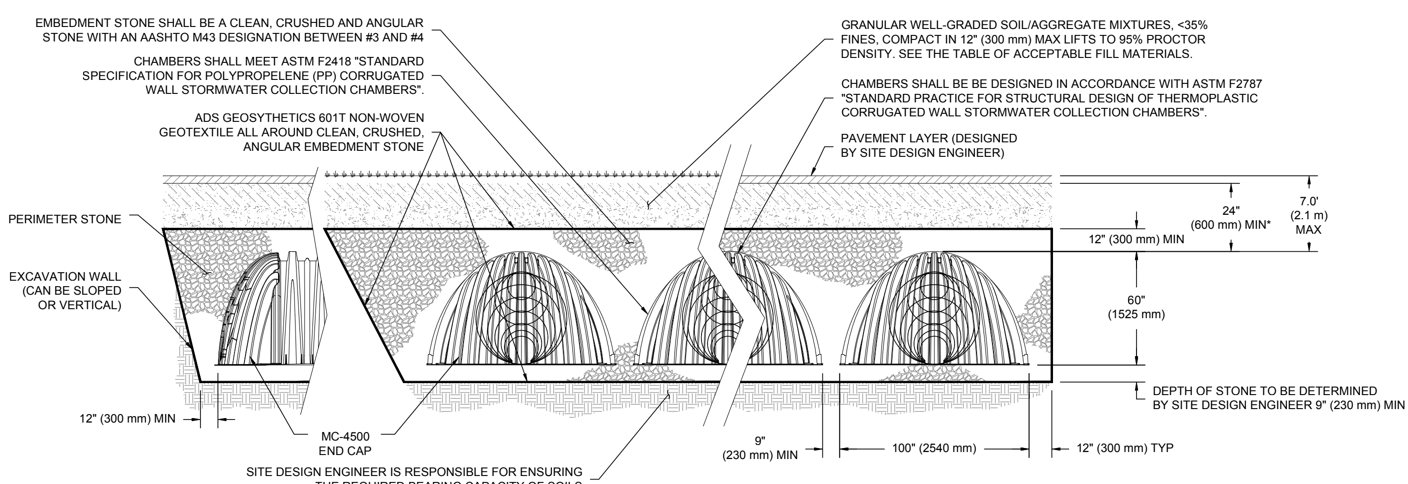
End Cap Storage
39.5 ft^3 (1.12 m^3)

Min. Installed Storage*
115.3 ft^3 (3.26 m^3)

Weight
Nominal 90.0 lbs (40.8 kg)

*Assumes a minimum of 12” (300 mm) of stone above, 9” (230 mm) of stone below, 12” (300 mm) of stone perimeter, 9” (230 mm) of stone between chambers/end caps and 40% stone porosity.





*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 30" (750 mm).

MC-4500 CHAMBER SPECIFICATIONS

STORAGE VOLUME PER CHAMBER FT³ (M³)

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Foundation Depth in. (mm)			
		9” (230 mm)	12” (300 mm)	15” (375 mm)	18” (450 mm)
MC-4500 Chamber	106.5 (3.01)	162.6 (4.60)	166.3 (4.71)	169.9 (4.81)	173.6 (4.91)
MC-4500 End Cap	39.5 (1.12)	115.3 (3.26)	118.6 (3.36)	121.9 (3.45)	125.2 (3.54)

Note: Assumes 9” (230 mm) row spacing, 40% stone porosity, 12” (300 mm) stone above and includes the bare chamber/end cap volume. End cap volume assumes 12” (300 mm) stone perimeter in front of end cap.

AMOUNT OF STONE PER CHAMBER

ENGLISH TONS (yds³)	Stone Foundation Depth			
	9”	12”	15”	18”
MC-4500 Chamber	7.4 (5.2)	7.8 (5.5)	8.3 (5.9)	8.8 (6.2)
MC-4500 End Cap	9.8 (7.0)	10.2 (7.3)	10.6 (7.6)	11.1 (7.9)
METRIC KILOGRAMS (m³)	230 mm	300 mm	375 mm	450 mm
MC-4500 Chamber	6713 (4.0)	7076 (4.2)	7529 (4.5)	7983 (4.7)
MC-4500 End Cap	8890 (5.3)	9253 (5.5)	9616 (5.8)	10069 (6.0)

Note: Assumes 12” (300 mm) of stone above and 9” (230 mm) row spacing and 12” (300 mm) of perimeter stone in front of end caps.

VOLUME EXCAVATION PER CHAMBER YD³ (M³)

	Stone Foundation Depth			
	9” (230 mm)	12” (300 mm)	15” (375mm)	18” (450 mm)
MC-4500 Chamber	10.5 (8.0)	10.8 (8.3)	11.2 (8.5)	11.5 (8.8)
MC-4500 End Cap	9.7 (7.4)	10.0 (7.6)	10.3 (7.9)	10.6 (8.1)

Note: Assumes 9” (230 mm) of separation between chamber rows, 12” (300 mm) of perimeter in front of the end caps, and 24” (600 mm) of cover. The volume of excavation will vary as depth of cover increases.

ADS DESIGN TOOL 2.0

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Visit us at www.stormtech.com
and utilize the StormTech Design Tool

For more information on the StormTech MC-4500 Chamber and other ADS products, please contact our Customer Service Representatives at 1-800-821-6710

*THE MOST **ADVANCED** NAME IN WATER MANAGEMENT SOLUTIONS™*

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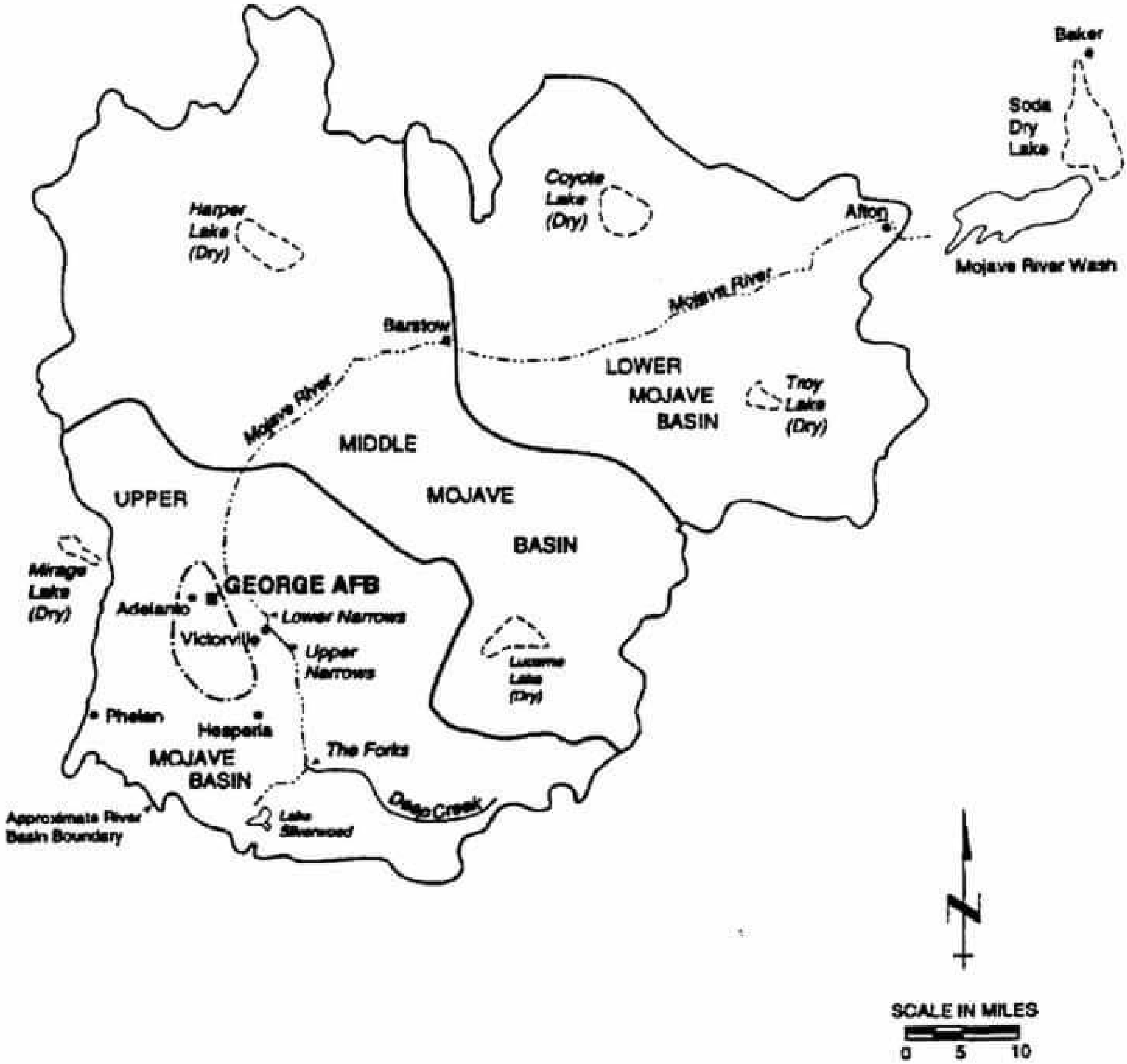


LEGEND

Perennial Flowing Stream

Intermittent Flowing Stream

Approximate Location of George Groundwater Sub-Basin (Subsurface Surveys, 1990)

SOURCE: SAIC, 1987

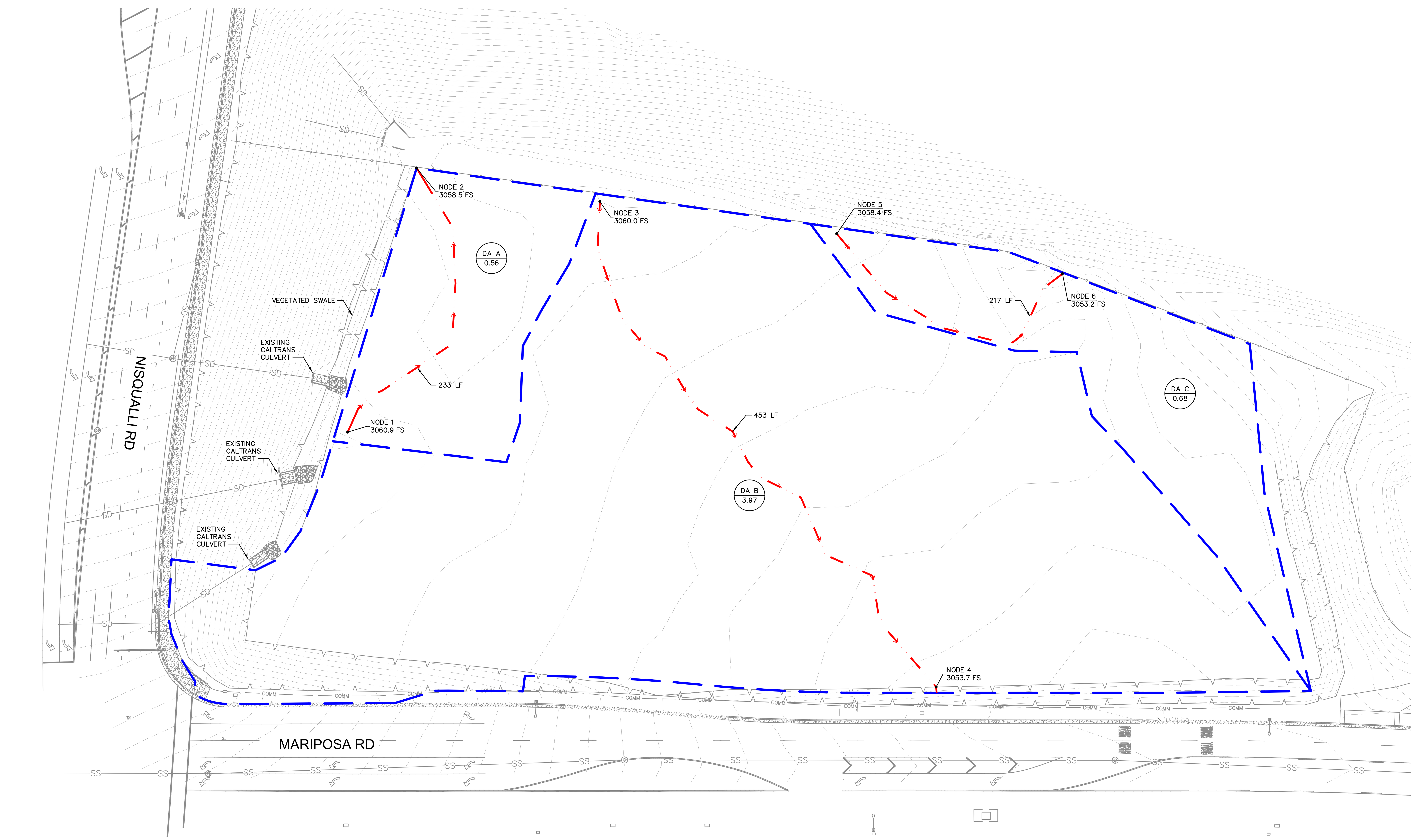
MONTGOMERY WATSON

MAJOR HYDROGEOLOGIC FEATURES IN THE MOJAVE RIVER BASIN

FIGURE 4

APPENDIX B

- Existing Condition Hydrology Exhibit with Drainage Arrows and Facilities
- Rational Method Data (Hydrology AES Models)
  - 10-year and 100-year



SITE DATA

PARCEL SIZE:	227,891± S.F. (5.23± AC)
LIMITS OF DISTURBANCE:	227,891± S.F. (5.23± AC)
ZONING:	COMMERCIAL
ADDRESS:	MARIPOSA ROAD & NASQUALLI ROAD VICTORVILLE, CA 92392
RECEIVING WATERS:	MOJAVE RIVER WATERSHED (RECEIVING WATER IS BELOW THE NARROWS)

SITE DATA

TOTAL SITE AREA (ACRES)	5.23
IMPERVIOUS AREA (%)	0
PERVIOUS AREA (%)	100

HYDROLOGY DATA

SUB-AREA	DA A	DA B	DA C
AREA (ACRES)	0.70	3.92	0.32
TIME OF CONCENTRATION PATH LENGTH (FEET)	233	453	217
10-YEAR, 24-HOUR FLOW CFS	0.87	5.60	1.13
10-YEAR, 24-HOUR FLOW CFS	1.63	10.59	2.11

APPROXIMATELY 0.08 AC OF DA B ARE NOT A PART OF THE PROJECT PARCEL

LEGEND

- PARCEL LINE
- CENTERLINE
- DRAINAGE AREA (DA)
- FLOW LINE
- XX EXISTING CONTOUR
- DA # / X AC — DA NAME DRAINAGE AREA

GRAPHIC SCALE IN FEET
0 20 40 80
1"=40'
WHEN PRINTED AT FULL SIZE (24" BY 36")

NORTH

BLDG Number	GP Number	Project Number

Kimley»Horn

3880 LEMON STREET, STE. 420, RIVERSIDE, CA 92501
PHONE: 951-543-9868

REGISTERED PROFESSIONAL ENGINEER
SHEA-MICHAEL ANTI
RCE NO. 78274
CIVIL
STATE OF CALIFORNIA
Seal
1/13/2021

MAVERIK
STORE #:TBD
MARIPOSA ROAD & NASQUALLI ROAD
VICTORVILLE, CA

MAVERIK
185 SOUTH STATE STREET, SUITE 800
SALT LAKE CITY, UT, 84111

REVISION

No.	DESCRIPTION	DATE	APPROVED

CITY OF VICTORVILLE CALIFORNIA

CITY CASE NO.

CITY OF VICTORVILLE
ENGINEERING DEPARTMENT
14343 Civic Drive, Victorville, CA 92392 (760) 955-5000

Approved By:
Brian W. Gengler, RCE C44730
City Engineer
DATE

Sheet Name
EXISTING DRAINAGE EXHIBIT

Sheet Number
1 OF 1

1ST SUBMITTAL 12/18/2020

\\RIVFP01\CA_RIV\RIV_LDEV\MAVERIK\195274001 - VICTORVILLE NISQUALLI\REPORTS\HYDROLOGY\EXHIBITS\2020.12.08_ VICTORVILLE NISQUALLI-EXISTING HYDROLOGY EXHIBIT.DWG 1/13/2021 10:59 PM ASTORGA, LUPITA

Rational Method Data (Hydrology AES Models)
Existing 10-year and 100-year

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
          (c) Copyright 1983-2011 Advanced Engineering Software (aes)
              Ver. 18.0  Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
 * Maverick Victorville                                                 *
 * Existing Conditions Rational Method                                  *
 * 10-year, 24-hour                                                     *
 ************************************************************************

  FILE NAME: MV_E.DAT
  TIME/DATE OF STUDY: 23:40 12/16/2020
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                  --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 1.00
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  4
   1)    5.00;  2.530
   2)   30.00;  1.050
   3)  160.00;  0.430
   4)  720.00;  0.153
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   233.00
  ELEVATION DATA: UPSTREAM(FEET) =   3060.93  DOWNSTREAM(FEET) =   3058.52

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.592
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.140
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "BARREN"                   A        0.56      0.42     1.000    78   11.59
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.87
  TOTAL AREA(ACRES) =      0.56   PEAK FLOW RATE(CFS) =      0.87

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   453.00
  ELEVATION DATA: UPSTREAM(FEET) =   3060.00  DOWNSTREAM(FEET) =   3053.69

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.250
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.982
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "BARREN"                   A        3.97      0.42     1.000    78   14.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      5.60
  TOTAL AREA(ACRES) =      3.97   PEAK FLOW RATE(CFS) =      5.60

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   217.00
  ELEVATION DATA: UPSTREAM(FEET) =   3058.43  DOWNSTREAM(FEET) =   3053.21

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.517
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.263
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "BARREN"                   A        0.68      0.42     1.000    78    9.52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.13
  TOTAL AREA(ACRES) =      0.68   PEAK FLOW RATE(CFS) =      1.13
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.7  TC(MIN.) =      9.52
  EFFECTIVE AREA(ACRES) =      0.68  AREA-AVERAGED Fm(INCH/HR)=  0.42
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =       1.13
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
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                           Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
 * Maverick Victorville                                                    *
 * Existing Conditions Rational Method                                     *
 * 100-year, 24-hour                                                       *
 **************************************************************************

  FILE NAME: MV_E100.DAT
  TIME/DATE OF STUDY: 00:02 12/17/2020
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                  --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 1.00
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  4
   1)    5.00;  4.320
   2)   30.00;  1.780
   3)  120.00;  0.724
   4)  720.00;  0.261
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   233.00
  ELEVATION DATA: UPSTREAM(FEET) =   3060.93  DOWNSTREAM(FEET) =   3058.52

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.592
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.650
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "BARREN"                   A        0.56      0.42     1.000    78   11.59
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
```
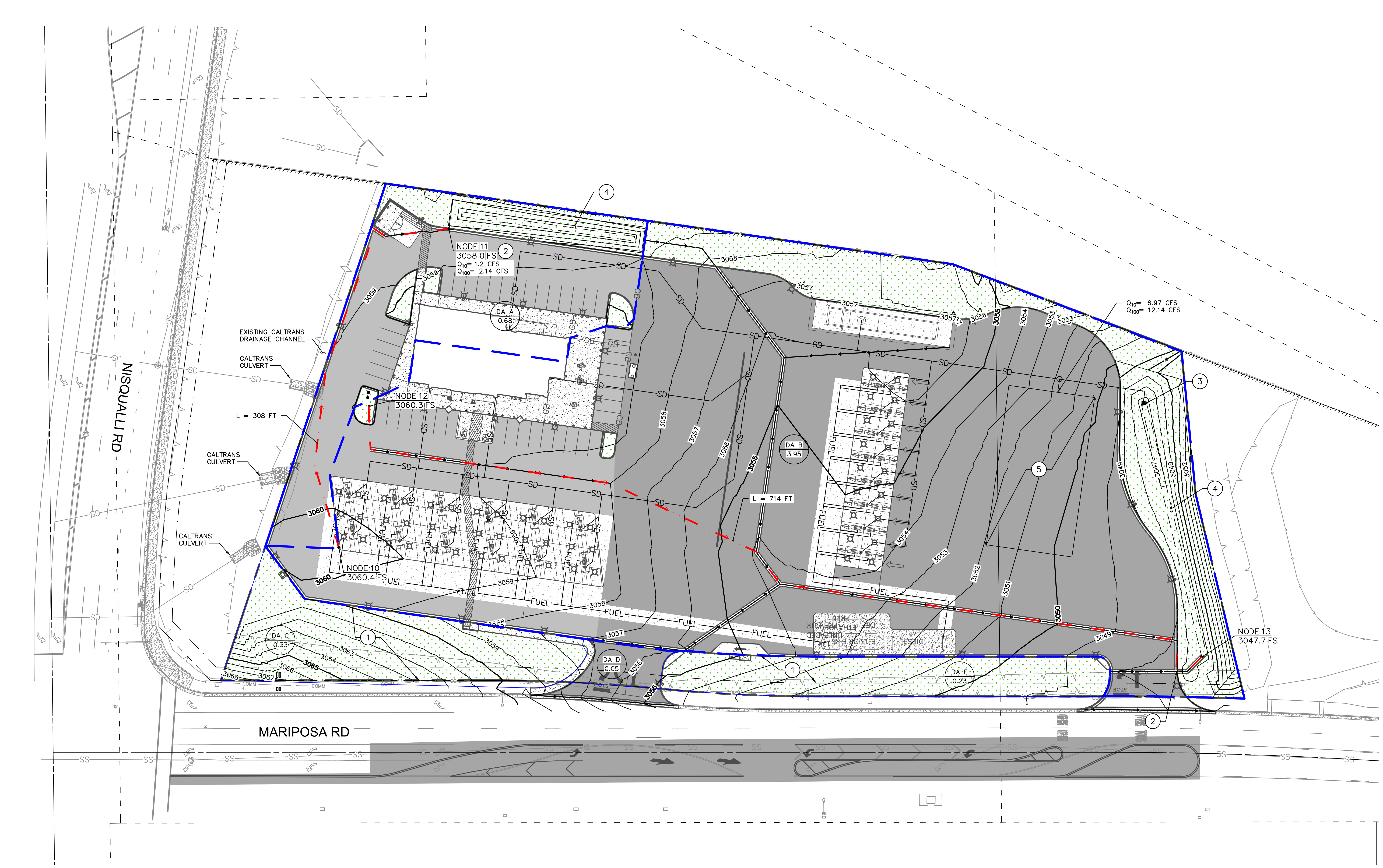

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.63
  TOTAL AREA(ACRES) =      0.56   PEAK FLOW RATE(CFS) =      1.63

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   453.00
  ELEVATION DATA: UPSTREAM(FEET) =   3060.00  DOWNSTREAM(FEET) =   3053.69

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.250
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.380
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "BARREN"                   A       3.97      0.42     1.000    78   14.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =     10.59
  TOTAL AREA(ACRES) =      3.97   PEAK FLOW RATE(CFS) =     10.59

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   217.00
  ELEVATION DATA: UPSTREAM(FEET) =   3058.43  DOWNSTREAM(FEET) =   3053.21

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.517
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.861
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "BARREN"                   A       0.68      0.42     1.000    78    9.52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.11
  TOTAL AREA(ACRES) =      0.68   PEAK FLOW RATE(CFS) =      2.11
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.7  TC(MIN.) =      9.52
  EFFECTIVE AREA(ACRES) =      0.68  AREA-AVERAGED Fm(INCH/HR)=  0.42
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =       2.11
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX C

- Proposed Condition Hydrology Exhibit with Drainage Arrows and Facilities
- Rational Method Data (Hydrology AES Models)
  - 10-year and 100-year
- Unit Hydrograph (Hydrology AES Models)
  - 10-year and 100-year
- Infiltration Systems Sizing and Draw Down Time



SITE DATA

PARCEL SIZE:	227,891± S.F. (5.23± AC)
LIMITS OF DISTURBANCE:	227,891± S.F. (5.23± AC)
PROPOSED IMPERVIOUS AREA:	174,662± S.F. (INCLUDING BLDG)
PROPOSED PERVIOUS AREA:	53,229± S.F.
PROPOSED BLDG AREA:	6,112± S.F.
APN:	3092–311–09 AND 3092–311–10
ZONING:	COMMERCIAL
ADDRESS:	NWC OF NISQUALLI ROAD AND MARIPOSA ROAD, VICTORVILLE
RECEIVING WATERS:	MOJAVE RIVER WATERSHED (RECEIVING WATER IS BELOW THE NARROWS)

STRUCTURAL BMP NOTES

1. SELF MITIGATING PERVIOUS AREA.
2. PROPOSED CURB CUT.
3. PROPOSED OVERFLOW DRAIN.
4. PROPOSED INFILTRATION BASIN.
5. PROPOSED ADS STORMTECH MC–4500 INFILTRATION SYSTEM.

SITE DATA

TOTAL SITE AREA (ACRES)	5.23	IMPERVIOUS AREA (%)	76
BUILDING AREA (ACRES)	0.14	PERVIOUS AREA (%)	24
LANDSCAPE AREA (ACRES)	1.22		

HYDROLOGY DATA

SUB-AREA	DA A	DA B	DA C	DA D	DA E
AREA (ACRES)	0.68	3.95	0.33	0.05	0.23
TIME OF CONCENTRATION PATH LENGTH (FEET)	308	714	SELF-TREATING AREA	SELF-TREATING AREA	SELF-TREATING AREA
10-YEAR, 24-HOUR FLOW CFS	1.2	6.97	SELF-TREATING	DE MINMUS	SELF-TREATING
100-YEAR, 24-HOUR FLOW CFS	2.14	12.14	SELF-TREATING	DE MINMUS	SELF-TREATING

LEGEND

— — —	BOUNDARY LINE
— – —	CENTERLINE
– – – (blue)	DRAINAGE AREA (DA)
– – – (red)	FLOW LINE
— XX —	EXISTING CONTOUR
2.00%	PROPOSED FLOW
DA # / X AC	DA NAME / DRAINAGE AREA

DRAINAGE NOTES

- THE PROPOSED SITE HAS ZERO DISCHARGE. ALL DRAINAGE IS CAPTURED AND TREATED ONSITE.
- REFER TO PROJECT CONSTRUCTION DOCUMENTS FOR PROPOSED STORM DRAIN INVERT AND SIZES.

NORTH

GRAPHIC SCALE IN FEET
0 20 40 80
1"=40'
WHEN PRINTED AT FULL SIZE (24" BY 36")

SOURCE CONTROL BMPS	
BMP ID	BMP DESCRIPTION
SC–74	ON–SITE STORM DRAIN INLETS
SC–41	PLAZA, SIDEWALKS, PARKING LOTS
SC–34	REFUSE / TRASH COLLECTION AREAS
SC–10	MISCELLANEOUS DRAIN OR WASH DOWN AREAS

SITE DESIGN BMPS	
BMP ID	BMP DESCRIPTION
SD–10, SD–12	LANDSCAPE / OUTDOOR PESTICIDE USE
SD–11	ROOF RUNOFF
SD–13	STORM DRAIN STENCILING AND SIGNAGE → ALL SD GRATED INLETS, CURB CUTS (TYP.)
SD–32	REFUSE / TRASH COLLECTION AREAS

PERMANENT BMP ID #	BMP PROVIDED	SURFACE AREA	DCV (SEE WQMP REPORT FORM 4.2–1)	100–YEAR, 24–HOUR VOLUME	100–YEAR DRAWDOWN
BMP 1	ADS STORMTECH MC–4500 INFILTRATION SYSTEM	7,766 S.F.	9,224 FT^3	55,321 FT^3	15 HOURS
BMP 2	INFILTRATION BASIN	402 S.F.			48 HOURS
BMP 3	INFILTRATION BASIN	438 S.F.	1371 FT^3	8,712 FT^3	15 HOURS

BLDG Number	GP Number	Project Number

Kimley»Horn

3880 LEMON STREET, STE. 420, RIVERSIDE, CA 92501
PHONE: 951–543–9868

Seal
1/13/2021

MAVERIK
STORE #:TBD
MARIPOSA ROAD & NASQUALLI ROAD
VICTORVILLE, CA

MAVERIK
185 SOUTH STATE STREET, SUITE 800
SALT LAKE CITY, UT. 84111

REVISION

No.	DESCRIPTION	DATE	APPROVED

CITY OF VICTORVILLE, CALIFORNIA

CITY CASE NO.
CITY OF VICTORVILLE ENGINEERING DEPARTMENT
14343 Civic Drive, Victorville, CA 92392 (760) 955-5000
Approved By:
Brian W. Gengler, RCE C44730
City Engineer
DATE

Sheet Name
HYDROLOGY EXHIBIT

Sheet Number
1 OF 1

1ST SUBMITTAL 12/18/2020

\\RIVFP01\CA_RIV\RIV_LDEV\MAVERIK\195274001 – VICTORVILLE NISQUALLI\REPORTS\HYDROLOGY\EXHIBITS\2020.12.15_PROPOSED HYDROLOGY EXHIBIT.DWG 1/13/2021 9:19 PM ASTORGA, LUPITA

Rational Method Data (Hydrology AES Models)
Post-Development 10-year and 100-year

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****************************************************************************
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                           Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* Maverick, Victorville                                                    *
* Proposed Conditions Rational Method                                      *
* 10-year, 24-hour                                                         *
 **************************************************************************

  FILE NAME: MV_P.DAT
  TIME/DATE OF STUDY: 19:08 01/13/2021
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  5
   1)    5.00;  2.530
   2)   15.00;  1.470
   3)   30.00;  1.050
   4)   60.00;  0.666
   5)  360.00;  0.231
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   308.00
  ELEVATION DATA: UPSTREAM(FEET) =   3060.40  DOWNSTREAM(FEET) =   3058.00
```

```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.465
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.163
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 A        0.68      0.98     0.200    32    8.47
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.20
  TOTAL AREA(ACRES) =      0.68   PEAK FLOW RATE(CFS) =      1.20

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   714.00
  ELEVATION DATA: UPSTREAM(FEET) =   3060.30  DOWNSTREAM(FEET) =   3047.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.441
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.059
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        3.95      0.98     0.100    32    9.44
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      6.97
  TOTAL AREA(ACRES) =      3.95   PEAK FLOW RATE(CFS) =      6.97
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.0  TC(MIN.) =      9.44
  EFFECTIVE AREA(ACRES) =      3.95  AREA-AVERAGED Fm(INCH/HR)=  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =      6.97
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
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                           Analysis prepared by:






 ************************** DESCRIPTION OF STUDY **************************
* Maverick, Victorville                                                    *
* Proposed Conditions Rational Method                                      *
* 100-year, 24-hour                                                        *
 **************************************************************************

  FILE NAME: MV_P100.DAT
  TIME/DATE OF STUDY: 19:10 01/13/2021
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  5
   1)    5.00;  4.320
   2)   15.00;  2.500
   3)   30.00;  1.780
   4)   60.00;  1.130
   5)  360.00;  0.388
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   308.00
  ELEVATION DATA: UPSTREAM(FEET) =   3060.40  DOWNSTREAM(FEET) =   3058.00
```

```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.465
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.689
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 A       0.68      0.98     0.200    32    8.47
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      2.14
  TOTAL AREA(ACRES) =      0.68   PEAK FLOW RATE(CFS) =      2.14

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   714.00
  ELEVATION DATA: UPSTREAM(FEET) =   3060.30  DOWNSTREAM(FEET) =   3047.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.441
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.512
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A       3.95      0.98     0.100    32    9.44
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     12.14
  TOTAL AREA(ACRES) =      3.95   PEAK FLOW RATE(CFS) =     12.14
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.0  TC(MIN.) =      9.44
  EFFECTIVE AREA(ACRES) =      3.95  AREA-AVERAGED Fm(INCH/HR)=  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =      12.14
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Proposed Unit Hydrograph (Hydrology AES Models)
Post-Development 10-year and 100-year

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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                           Analysis prepared by:






****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  Maverick Victorville
  Drainage Area A
  10-year Storm Event
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.62 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1          0.68       21.00           32.       0.975       0.721

    TOTAL AREA (Acres) =      0.68
                             _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.205
                                     _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.279
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 Problem Descriptions:
  Maverick Victorville
  Drainage Area A
  10-year Storm Event
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    0.68
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.205
    LOW LOSS FRACTION = 0.279
    TIME OF CONCENTRATION(MIN.) =  8.00
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  10
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.21
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.52
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.67
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.03
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.39
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.62

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    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.11
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.04

****************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.13      0.0001      0.02  Q         .         .         .         .
  0.27      0.0004      0.02  Q         .         .         .         .
  0.40      0.0007      0.02  Q         .         .         .         .
  0.53      0.0010      0.02  Q         .         .         .         .
  0.67      0.0012      0.02  Q         .         .         .         .
  0.80      0.0015      0.03  Q         .         .         .         .
  0.93      0.0018      0.03  Q         .         .         .         .
  1.07      0.0021      0.03  Q         .         .         .         .
  1.20      0.0023      0.03  Q         .         .         .         .
  1.33      0.0026      0.03  Q         .         .         .         .
  1.47      0.0029      0.03  Q         .         .         .         .
  1.60      0.0032      0.03  Q         .         .         .         .
  1.73      0.0035      0.03  Q         .         .         .         .
  1.87      0.0038      0.03  Q         .         .         .         .
  2.00      0.0040      0.03  Q         .         .         .         .
  2.13      0.0043      0.03  Q         .         .         .         .
  2.27      0.0046      0.03  Q         .         .         .         .
  2.40      0.0049      0.03  Q         .         .         .         .
  2.53      0.0052      0.03  Q         .         .         .         .
  2.67      0.0055      0.03  Q         .         .         .         .
  2.80      0.0058      0.03  Q         .         .         .         .
  2.93      0.0061      0.03  Q         .         .         .         .
  3.07      0.0064      0.03  Q         .         .         .         .
  3.20      0.0067      0.03  Q         .         .         .         .
  3.33      0.0070      0.03  Q         .         .         .         .
  3.47      0.0073      0.03  Q         .         .         .         .
  3.60      0.0076      0.03  Q         .         .         .         .
  3.73      0.0079      0.03  Q         .         .         .         .
  3.87      0.0082      0.03  Q         .         .         .         .
  4.00      0.0086      0.03  Q         .         .         .         .
  4.13      0.0089      0.03  Q         .         .         .         .
  4.27      0.0092      0.03  Q         .         .         .         .
  4.40      0.0095      0.03  Q         .         .         .         .
  4.53      0.0098      0.03  Q         .         .         .         .
  4.67      0.0101      0.03  Q         .         .         .         .
  4.80      0.0105      0.03  Q         .         .         .         .
  4.93      0.0108      0.03  Q         .         .         .         .
  5.07      0.0111      0.03  Q         .         .         .         .
  5.20      0.0115      0.03  Q         .         .         .         .
  5.33      0.0118      0.03  Q         .         .         .         .
  5.47      0.0121      0.03  Q         .         .         .         .
  5.60      0.0125      0.03  Q         .         .         .         .
  5.73      0.0128      0.03  Q         .         .         .         .
  5.87      0.0131      0.03  Q         .         .         .         .
  6.00      0.0135      0.03  Q         .         .         .         .
  6.13      0.0138      0.03  Q         .         .         .         .
  6.27      0.0142      0.03  Q         .         .         .         .
  6.40      0.0145      0.03  Q         .         .         .         .
  6.53      0.0149      0.03  Q         .         .         .         .
  6.67      0.0152      0.03  Q         .         .         .         .
  6.80      0.0156      0.03  Q         .         .         .         .
  6.93      0.0160      0.03  Q         .         .         .         .
  7.07      0.0163      0.03  Q         .         .         .         .
  7.20      0.0167      0.03  Q         .         .         .         .
  7.33      0.0171      0.03  Q         .         .         .         .
  7.47      0.0175      0.03  Q         .         .         .         .
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  7.60       0.0178       0.03  Q         .         .         .         .
  7.73       0.0182       0.03  Q         .         .         .         .
  7.87       0.0186       0.04  Q         .         .         .         .
  8.00       0.0190       0.04  Q         .         .         .         .
  8.13       0.0194       0.04  Q         .         .         .         .
  8.27       0.0198       0.04  Q         .         .         .         .
  8.40       0.0202       0.04  Q         .         .         .         .
  8.53       0.0206       0.04  Q         .         .         .         .
  8.67       0.0210       0.04  Q         .         .         .         .
  8.80       0.0214       0.04  Q         .         .         .         .
  8.93       0.0218       0.04  Q         .         .         .         .
  9.07       0.0222       0.04  Q         .         .         .         .
  9.20       0.0226       0.04  Q         .         .         .         .
  9.33       0.0231       0.04  Q         .         .         .         .
  9.47       0.0235       0.04  Q         .         .         .         .
  9.60       0.0239       0.04  Q         .         .         .         .
  9.73       0.0244       0.04  Q         .         .         .         .
  9.87       0.0248       0.04  Q         .         .         .         .
 10.00       0.0253       0.04  Q         .         .         .         .
 10.13       0.0257       0.04  Q         .         .         .         .
 10.27       0.0262       0.04  Q         .         .         .         .
 10.40       0.0267       0.04  Q         .         .         .         .
 10.53       0.0272       0.04  Q         .         .         .         .
 10.67       0.0276       0.04  Q         .         .         .         .
 10.80       0.0281       0.04  Q         .         .         .         .
 10.93       0.0286       0.05  Q         .         .         .         .
 11.07       0.0291       0.05  Q         .         .         .         .
 11.20       0.0296       0.05  Q         .         .         .         .
 11.33       0.0301       0.05  Q         .         .         .         .
 11.47       0.0307       0.05  Q         .         .         .         .
 11.60       0.0312       0.05  Q         .         .         .         .
 11.73       0.0317       0.05  Q         .         .         .         .
 11.87       0.0323       0.05  Q         .         .         .         .
 12.00       0.0328       0.05  Q         .         .         .         .
 12.13       0.0334       0.05  Q         .         .         .         .
 12.27       0.0339       0.05  Q         .         .         .         .
 12.40       0.0345       0.05  Q         .         .         .         .
 12.53       0.0351       0.05  Q         .         .         .         .
 12.67       0.0357       0.05  Q         .         .         .         .
 12.80       0.0363       0.05  Q         .         .         .         .
 12.93       0.0369       0.06  Q         .         .         .         .
 13.07       0.0375       0.06  Q         .         .         .         .
 13.20       0.0381       0.06  Q         .         .         .         .
 13.33       0.0388       0.06  Q         .         .         .         .
 13.47       0.0395       0.06  Q         .         .         .         .
 13.60       0.0402       0.06  Q         .         .         .         .
 13.73       0.0409       0.07  Q         .         .         .         .
 13.87       0.0416       0.07  Q         .         .         .         .
 14.00       0.0424       0.07  Q         .         .         .         .
 14.13       0.0432       0.07  Q         .         .         .         .
 14.27       0.0439       0.07  Q         .         .         .         .
 14.40       0.0447       0.07  Q         .         .         .         .
 14.53       0.0455       0.08  Q         .         .         .         .
 14.67       0.0464       0.08  Q         .         .         .         .
 14.80       0.0473       0.09  Q         .         .         .         .
 14.93       0.0483       0.09  Q         .         .         .         .
 15.07       0.0494       0.10  Q         .         .         .         .
 15.20       0.0505       0.11  Q         .         .         .         .
 15.33       0.0518       0.12  Q         .         .         .         .
 15.47       0.0531       0.12  Q         .         .         .         .
 15.60       0.0545       0.14  Q         .         .         .         .
 15.73       0.0562       0.16  Q         .         .         .         .
 15.87       0.0588       0.32  .Q        .         .         .         .
```

```
 16.00      0.0630      0.44  .Q        .         .         .         .
 16.13      0.0721      1.23  .   Q     .         .         .         .
 16.27      0.0803      0.25  Q         .         .         .         .
 16.40      0.0823      0.12  Q         .         .         .         .
 16.53      0.0836      0.11  Q         .         .         .         .
 16.67      0.0848      0.10  Q         .         .         .         .
 16.80      0.0858      0.08  Q         .         .         .         .
 16.93      0.0866      0.08  Q         .         .         .         .
 17.07      0.0874      0.07  Q         .         .         .         .
 17.20      0.0882      0.07  Q         .         .         .         .
 17.33      0.0889      0.06  Q         .         .         .         .
 17.47      0.0896      0.06  Q         .         .         .         .
 17.60      0.0903      0.06  Q         .         .         .         .
 17.73      0.0909      0.06  Q         .         .         .         .
 17.87      0.0915      0.05  Q         .         .         .         .
 18.00      0.0921      0.05  Q         .         .         .         .
 18.13      0.0926      0.05  Q         .         .         .         .
 18.27      0.0932      0.05  Q         .         .         .         .
 18.40      0.0937      0.05  Q         .         .         .         .
 18.53      0.0943      0.05  Q         .         .         .         .
 18.67      0.0948      0.05  Q         .         .         .         .
 18.80      0.0953      0.04  Q         .         .         .         .
 18.93      0.0957      0.04  Q         .         .         .         .
 19.07      0.0962      0.04  Q         .         .         .         .
 19.20      0.0967      0.04  Q         .         .         .         .
 19.33      0.0971      0.04  Q         .         .         .         .
 19.47      0.0975      0.04  Q         .         .         .         .
 19.60      0.0980      0.04  Q         .         .         .         .
 19.73      0.0984      0.04  Q         .         .         .         .
 19.87      0.0988      0.04  Q         .         .         .         .
 20.00      0.0992      0.04  Q         .         .         .         .
 20.13      0.0996      0.04  Q         .         .         .         .
 20.27      0.1000      0.03  Q         .         .         .         .
 20.40      0.1004      0.03  Q         .         .         .         .
 20.53      0.1007      0.03  Q         .         .         .         .
 20.67      0.1011      0.03  Q         .         .         .         .
 20.80      0.1015      0.03  Q         .         .         .         .
 20.93      0.1018      0.03  Q         .         .         .         .
 21.07      0.1022      0.03  Q         .         .         .         .
 21.20      0.1025      0.03  Q         .         .         .         .
 21.33      0.1029      0.03  Q         .         .         .         .
 21.47      0.1032      0.03  Q         .         .         .         .
 21.60      0.1035      0.03  Q         .         .         .         .
 21.73      0.1039      0.03  Q         .         .         .         .
 21.87      0.1042      0.03  Q         .         .         .         .
 22.00      0.1045      0.03  Q         .         .         .         .
 22.13      0.1048      0.03  Q         .         .         .         .
 22.27      0.1052      0.03  Q         .         .         .         .
 22.40      0.1055      0.03  Q         .         .         .         .
 22.53      0.1058      0.03  Q         .         .         .         .
 22.67      0.1061      0.03  Q         .         .         .         .
 22.80      0.1064      0.03  Q         .         .         .         .
 22.93      0.1067      0.03  Q         .         .         .         .
 23.07      0.1070      0.03  Q         .         .         .         .
 23.20      0.1072      0.03  Q         .         .         .         .
 23.33      0.1075      0.03  Q         .         .         .         .
 23.47      0.1078      0.03  Q         .         .         .         .
 23.60      0.1081      0.03  Q         .         .         .         .
 23.73      0.1084      0.03  Q         .         .         .         .
 23.87      0.1086      0.02  Q         .         .         .         .
 24.00      0.1089      0.02  Q         .         .         .         .
 24.13      0.1091      0.00  Q         .         .         .         .
----------------------------------------------------------------------------
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1440.0
10%	56.0
20%	32.0
30%	16.0
40%	8.0
50%	8.0
60%	8.0
70%	8.0
80%	8.0
90%	8.0

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****************************************************************************
                      SMALL AREA UNIT HYDROGRAPH MODEL
============================================================================
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             Ver. 18.0  Release Date: 05/01/2011  License ID 1499

                           Analysis prepared by:







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----------------------------------------------------------------------------

 Problem Descriptions:
  Maverick Victorville
  Drainage Area A
  100-year Storm Event
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    0.68
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.156
    LOW LOSS FRACTION = 0.224
    TIME OF CONCENTRATION(MIN.) =  8.00
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) = 100
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.36
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.89
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.13
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.73
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.33
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.51

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.20
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.05

****************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.13      0.0003      0.05  Q         .         .         .         .
  0.27      0.0008      0.05  Q         .         .         .         .
  0.40      0.0013      0.05  Q         .         .         .         .
  0.53      0.0018      0.05  Q         .         .         .         .
  0.67      0.0024      0.05  Q         .         .         .         .
  0.80      0.0029      0.05  Q         .         .         .         .
  0.93      0.0034      0.05  Q         .         .         .         .
  1.07      0.0040      0.05  Q         .         .         .         .
  1.20      0.0045      0.05  Q         .         .         .         .
  1.33      0.0050      0.05  Q         .         .         .         .
  1.47      0.0056      0.05  Q         .         .         .         .
  1.60      0.0061      0.05  Q         .         .         .         .
  1.73      0.0067      0.05  Q         .         .         .         .
  1.87      0.0072      0.05  Q         .         .         .         .
  2.00      0.0078      0.05  Q         .         .         .         .
```

2.13	0.0083	0.05	Q	.	.	.	.
2.27	0.0089	0.05	Q	.	.	.	.
2.40	0.0095	0.05	Q	.	.	.	.
2.53	0.0100	0.05	Q	.	.	.	.
2.67	0.0106	0.05	Q	.	.	.	.
2.80	0.0112	0.05	Q	.	.	.	.
2.93	0.0118	0.05	Q	.	.	.	.
3.07	0.0123	0.05	Q	.	.	.	.
3.20	0.0129	0.05	Q	.	.	.	.
3.33	0.0135	0.05	Q	.	.	.	.
3.47	0.0141	0.05	Q	.	.	.	.
3.60	0.0147	0.05	Q	.	.	.	.
3.73	0.0153	0.05	Q	.	.	.	.
3.87	0.0159	0.05	Q	.	.	.	.
4.00	0.0165	0.05	Q	.	.	.	.
4.13	0.0171	0.06	Q	.	.	.	.
4.27	0.0177	0.06	Q	.	.	.	.
4.40	0.0183	0.06	Q	.	.	.	.
4.53	0.0189	0.06	Q	.	.	.	.
4.67	0.0195	0.06	Q	.	.	.	.
4.80	0.0201	0.06	Q	.	.	.	.
4.93	0.0208	0.06	Q	.	.	.	.
5.07	0.0214	0.06	Q	.	.	.	.
5.20	0.0220	0.06	Q	.	.	.	.
5.33	0.0227	0.06	Q	.	.	.	.
5.47	0.0233	0.06	Q	.	.	.	.
5.60	0.0240	0.06	Q	.	.	.	.
5.73	0.0246	0.06	Q	.	.	.	.
5.87	0.0253	0.06	Q	.	.	.	.
6.00	0.0259	0.06	Q	.	.	.	.
6.13	0.0266	0.06	Q	.	.	.	.
6.27	0.0273	0.06	Q	.	.	.	.
6.40	0.0279	0.06	Q	.	.	.	.
6.53	0.0286	0.06	Q	.	.	.	.
6.67	0.0293	0.06	Q	.	.	.	.
6.80	0.0300	0.06	Q	.	.	.	.
6.93	0.0307	0.06	Q	.	.	.	.
7.07	0.0314	0.06	Q	.	.	.	.
7.20	0.0321	0.06	Q	.	.	.	.
7.33	0.0328	0.06	Q	.	.	.	.
7.47	0.0335	0.07	Q	.	.	.	.
7.60	0.0342	0.07	Q	.	.	.	.
7.73	0.0350	0.07	Q	.	.	.	.
7.87	0.0357	0.07	Q	.	.	.	.
8.00	0.0364	0.07	Q	.	.	.	.
8.13	0.0372	0.07	Q	.	.	.	.
8.27	0.0379	0.07	Q	.	.	.	.
8.40	0.0387	0.07	Q	.	.	.	.
8.53	0.0395	0.07	Q	.	.	.	.
8.67	0.0402	0.07	Q	.	.	.	.
8.80	0.0410	0.07	Q	.	.	.	.
8.93	0.0418	0.07	Q	.	.	.	.
9.07	0.0426	0.07	Q	.	.	.	.
9.20	0.0434	0.07	Q	.	.	.	.
9.33	0.0442	0.07	Q	.	.	.	.
9.47	0.0450	0.07	Q	.	.	.	.
9.60	0.0459	0.08	Q	.	.	.	.
9.73	0.0467	0.08	Q	.	.	.	.
9.87	0.0475	0.08	Q	.	.	.	.
10.00	0.0484	0.08	Q	.	.	.	.
10.13	0.0493	0.08	Q	.	.	.	.
10.27	0.0501	0.08	Q	.	.	.	.
10.40	0.0510	0.08	Q	.	.	.	.

```
10.53      0.0519      0.08  Q         .         .         .         .
10.67      0.0528      0.08  Q         .         .         .         .
10.80      0.0538      0.08  Q         .         .         .         .
10.93      0.0547      0.09  Q         .         .         .         .
11.07      0.0556      0.09  Q         .         .         .         .
11.20      0.0566      0.09  Q         .         .         .         .
11.33      0.0576      0.09  Q         .         .         .         .
11.47      0.0586      0.09  Q         .         .         .         .
11.60      0.0596      0.09  Q         .         .         .         .
11.73      0.0606      0.09  Q         .         .         .         .
11.87      0.0616      0.09  Q         .         .         .         .
12.00      0.0627      0.10  Q         .         .         .         .
12.13      0.0637      0.09  Q         .         .         .         .
12.27      0.0647      0.09  Q         .         .         .         .
12.40      0.0657      0.09  Q         .         .         .         .
12.53      0.0667      0.09  Q         .         .         .         .
12.67      0.0677      0.10  Q         .         .         .         .
12.80      0.0688      0.10  Q         .         .         .         .
12.93      0.0699      0.10  Q         .         .         .         .
13.07      0.0710      0.10  Q         .         .         .         .
13.20      0.0722      0.11  Q         .         .         .         .
13.33      0.0733      0.11  Q         .         .         .         .
13.47      0.0746      0.11  Q         .         .         .         .
13.60      0.0758      0.11  Q         .         .         .         .
13.73      0.0771      0.12  Q         .         .         .         .
13.87      0.0784      0.12  Q         .         .         .         .
14.00      0.0798      0.13  Q         .         .         .         .
14.13      0.0812      0.12  Q         .         .         .         .
14.27      0.0825      0.12  Q         .         .         .         .
14.40      0.0839      0.13  Q         .         .         .         .
14.53      0.0854      0.14  Q         .         .         .         .
14.67      0.0870      0.14  Q         .         .         .         .
14.80      0.0886      0.15  Q         .         .         .         .
14.93      0.0903      0.16  Q         .         .         .         .
15.07      0.0922      0.18  Q         .         .         .         .
15.20      0.0942      0.19  Q         .         .         .         .
15.33      0.0964      0.21  Q         .         .         .         .
15.47      0.0988      0.22  Q         .         .         .         .
15.60      0.1014      0.25  Q         .         .         .         .
15.73      0.1043      0.29  .Q        .         .         .         .
15.87      0.1095      0.65  . Q       .         .         .         .
16.00      0.1179      0.87  .  Q      .         .         .         .
16.13      0.1349      2.22  .       Q .         .         .         .
16.27      0.1498      0.48  .Q        .         .         .         .
16.40      0.1537      0.22  Q         .         .         .         .
16.53      0.1561      0.20  Q         .         .         .         .
16.67      0.1581      0.17  Q         .         .         .         .
16.80      0.1598      0.15  Q         .         .         .         .
16.93      0.1614      0.13  Q         .         .         .         .
17.07      0.1628      0.12  Q         .         .         .         .
17.20      0.1641      0.12  Q         .         .         .         .
17.33      0.1655      0.12  Q         .         .         .         .
17.47      0.1667      0.11  Q         .         .         .         .
17.60      0.1679      0.10  Q         .         .         .         .
17.73      0.1690      0.10  Q         .         .         .         .
17.87      0.1701      0.09  Q         .         .         .         .
18.00      0.1711      0.09  Q         .         .         .         .
18.13      0.1721      0.10  Q         .         .         .         .
18.27      0.1732      0.09  Q         .         .         .         .
18.40      0.1742      0.09  Q         .         .         .         .
18.53      0.1752      0.09  Q         .         .         .         .
18.67      0.1762      0.09  Q         .         .         .         .
18.80      0.1771      0.08  Q         .         .         .         .
```

```
 18.93      0.1780      0.08  Q          .         .         .         .
 19.07      0.1789      0.08  Q          .         .         .         .
 19.20      0.1798      0.08  Q          .         .         .         .
 19.33      0.1806      0.08  Q          .         .         .         .
 19.47      0.1814      0.07  Q          .         .         .         .
 19.60      0.1822      0.07  Q          .         .         .         .
 19.73      0.1830      0.07  Q          .         .         .         .
 19.87      0.1838      0.07  Q          .         .         .         .
 20.00      0.1846      0.07  Q          .         .         .         .
 20.13      0.1853      0.07  Q          .         .         .         .
 20.27      0.1861      0.07  Q          .         .         .         .
 20.40      0.1868      0.07  Q          .         .         .         .
 20.53      0.1875      0.06  Q          .         .         .         .
 20.67      0.1882      0.06  Q          .         .         .         .
 20.80      0.1889      0.06  Q          .         .         .         .
 20.93      0.1896      0.06  Q          .         .         .         .
 21.07      0.1903      0.06  Q          .         .         .         .
 21.20      0.1909      0.06  Q          .         .         .         .
 21.33      0.1916      0.06  Q          .         .         .         .
 21.47      0.1922      0.06  Q          .         .         .         .
 21.60      0.1929      0.06  Q          .         .         .         .
 21.73      0.1935      0.06  Q          .         .         .         .
 21.87      0.1941      0.06  Q          .         .         .         .
 22.00      0.1948      0.06  Q          .         .         .         .
 22.13      0.1954      0.05  Q          .         .         .         .
 22.27      0.1960      0.05  Q          .         .         .         .
 22.40      0.1966      0.05  Q          .         .         .         .
 22.53      0.1971      0.05  Q          .         .         .         .
 22.67      0.1977      0.05  Q          .         .         .         .
 22.80      0.1983      0.05  Q          .         .         .         .
 22.93      0.1989      0.05  Q          .         .         .         .
 23.07      0.1994      0.05  Q          .         .         .         .
 23.20      0.2000      0.05  Q          .         .         .         .
 23.33      0.2005      0.05  Q          .         .         .         .
 23.47      0.2011      0.05  Q          .         .         .         .
 23.60      0.2016      0.05  Q          .         .         .         .
 23.73      0.2022      0.05  Q          .         .         .         .
 23.87      0.2027      0.05  Q          .         .         .         .
 24.00      0.2032      0.05  Q          .         .         .         .
 24.13      0.2035      0.00  Q          .         .         .         .
 ----------------------------------------------------------------------------
-------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                Duration
        Peak Flow Rate                     (minutes)
    =======================                =========
               0%                           1440.0
              10%                             56.0
              20%                             32.0
              30%                             16.0
              40%                              8.0
              50%                              8.0
              60%                              8.0
              70%                              8.0
              80%                              8.0
              90%                              8.0
```

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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                           Analysis prepared by:






****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  Maverick Victorville
  Drainage Area B
  10-year Storm Event
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.62 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1          3.95       13.00           32.       0.975       0.794

    TOTAL AREA (Acres) =      3.95
                                    _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.127
                                            _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.206
============================================================================

 Problem Descriptions:
  Maverick Victorville
  Drainage Area B
  10-year Storm Event
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    3.95
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.127
    LOW LOSS FRACTION = 0.206
    TIME OF CONCENTRATION(MIN.) =  9.00
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  10
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.21
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.52
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.67
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.03
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.39
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.62

----------------------------------------------------------------------------
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```
    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.69
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.17

****************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.10      0.0000      0.00  Q         .         .         .         .
  0.25      0.0010      0.16  Q         .         .         .         .
  0.40      0.0029      0.16  Q         .         .         .         .
  0.55      0.0049      0.16  Q         .         .         .         .
  0.70      0.0069      0.16  Q         .         .         .         .
  0.85      0.0089      0.16  Q         .         .         .         .
  1.00      0.0108      0.16  Q         .         .         .         .
  1.15      0.0129      0.16  Q         .         .         .         .
  1.30      0.0149      0.16  Q         .         .         .         .
  1.45      0.0169      0.16  Q         .         .         .         .
  1.60      0.0189      0.16  Q         .         .         .         .
  1.75      0.0210      0.17  Q         .         .         .         .
  1.90      0.0231      0.17  Q         .         .         .         .
  2.05      0.0251      0.17  Q         .         .         .         .
  2.20      0.0272      0.17  Q         .         .         .         .
  2.35      0.0293      0.17  Q         .         .         .         .
  2.50      0.0314      0.17  Q         .         .         .         .
  2.65      0.0335      0.17  Q         .         .         .         .
  2.80      0.0357      0.17  Q         .         .         .         .
  2.95      0.0378      0.17  Q         .         .         .         .
  3.10      0.0400      0.17  Q         .         .         .         .
  3.25      0.0422      0.18  Q         .         .         .         .
  3.40      0.0444      0.18  Q         .         .         .         .
  3.55      0.0466      0.18  Q         .         .         .         .
  3.70      0.0488      0.18  Q         .         .         .         .
  3.85      0.0510      0.18  Q         .         .         .         .
  4.00      0.0533      0.18  Q         .         .         .         .
  4.15      0.0555      0.18  Q         .         .         .         .
  4.30      0.0578      0.18  Q         .         .         .         .
  4.45      0.0601      0.19  Q         .         .         .         .
  4.60      0.0624      0.19  Q         .         .         .         .
  4.75      0.0647      0.19  Q         .         .         .         .
  4.90      0.0671      0.19  Q         .         .         .         .
  5.05      0.0695      0.19  Q         .         .         .         .
  5.20      0.0718      0.19  Q         .         .         .         .
  5.35      0.0742      0.19  Q         .         .         .         .
  5.50      0.0766      0.20  Q         .         .         .         .
  5.65      0.0791      0.20  Q         .         .         .         .
  5.80      0.0815      0.20  Q         .         .         .         .
  5.95      0.0840      0.20  Q         .         .         .         .
  6.10      0.0865      0.20  Q         .         .         .         .
  6.25      0.0890      0.20  Q         .         .         .         .
  6.40      0.0915      0.20  Q         .         .         .         .
  6.55      0.0941      0.21  Q         .         .         .         .
  6.70      0.0967      0.21  Q         .         .         .         .
  6.85      0.0993      0.21  Q         .         .         .         .
  7.00      0.1019      0.21  Q         .         .         .         .
  7.15      0.1045      0.21  Q         .         .         .         .
  7.30      0.1072      0.22  Q         .         .         .         .
  7.45      0.1099      0.22  Q         .         .         .         .
  7.60      0.1126      0.22  Q         .         .         .         .
  7.75      0.1153      0.22  Q         .         .         .         .
  7.90      0.1181      0.22  Q         .         .         .         .
  8.05      0.1209      0.23  Q         .         .         .         .
  8.20      0.1237      0.23  Q         .         .         .         .
  8.35      0.1266      0.23  Q         .         .         .         .
```

```
 8.50      0.1295      0.23  Q         .         .         .         .
 8.65      0.1324      0.24  Q         .         .         .         .
 8.80      0.1354      0.24  Q         .         .         .         .
 8.95      0.1383      0.24  Q         .         .         .         .
 9.10      0.1414      0.24  Q         .         .         .         .
 9.25      0.1444      0.25  Q         .         .         .         .
 9.40      0.1475      0.25  .Q        .         .         .         .
 9.55      0.1506      0.25  .Q        .         .         .         .
 9.70      0.1538      0.26  .Q        .         .         .         .
 9.85      0.1570      0.26  .Q        .         .         .         .
10.00      0.1602      0.26  .Q        .         .         .         .
10.15      0.1635      0.27  .Q        .         .         .         .
10.30      0.1669      0.27  .Q        .         .         .         .
10.45      0.1702      0.28  .Q        .         .         .         .
10.60      0.1737      0.28  .Q        .         .         .         .
10.75      0.1772      0.28  .Q        .         .         .         .
10.90      0.1807      0.29  .Q        .         .         .         .
11.05      0.1843      0.29  .Q        .         .         .         .
11.20      0.1879      0.30  .Q        .         .         .         .
11.35      0.1916      0.30  .Q        .         .         .         .
11.50      0.1954      0.31  .Q        .         .         .         .
11.65      0.1993      0.31  .Q        .         .         .         .
11.80      0.2032      0.32  .Q        .         .         .         .
11.95      0.2072      0.33  .Q        .         .         .         .
12.10      0.2112      0.33  .Q        .         .         .         .
12.25      0.2153      0.32  .Q        .         .         .         .
12.40      0.2193      0.33  .Q        .         .         .         .
12.55      0.2234      0.34  .Q        .         .         .         .
12.70      0.2276      0.34  .Q        .         .         .         .
12.85      0.2319      0.35  .Q        .         .         .         .
13.00      0.2363      0.36  .Q        .         .         .         .
13.15      0.2408      0.37  .Q        .         .         .         .
13.30      0.2455      0.38  .Q        .         .         .         .
13.45      0.2503      0.40  .Q        .         .         .         .
13.60      0.2553      0.41  .Q        .         .         .         .
13.75      0.2605      0.42  .Q        .         .         .         .
13.90      0.2658      0.44  .Q        .         .         .         .
14.05      0.2714      0.46  .Q        .         .         .         .
14.20      0.2769      0.43  .Q        .         .         .         .
14.35      0.2824      0.46  .Q        .         .         .         .
14.50      0.2883      0.48  .Q        .         .         .         .
14.65      0.2945      0.52  . Q       .         .         .         .
14.80      0.3011      0.54  . Q       .         .         .         .
14.95      0.3081      0.60  . Q       .         .         .         .
15.10      0.3157      0.63  . Q       .         .         .         .
15.25      0.3241      0.72  . Q       .         .         .         .
15.40      0.3333      0.77  .  Q      .         .         .         .
15.55      0.3432      0.82  .  Q      .         .         .         .
15.70      0.3541      0.94  .  Q      .         .         .         .
15.85      0.3719      1.93  .      Q  .         .         .         .
16.00      0.4003      2.66  .         Q         .         .         .
16.15      0.4601      6.99  .         .         .      Q  .         .
16.30      0.5113      1.28  .    Q    .         .         .         .
16.45      0.5241      0.77  .  Q      .         .         .         .
16.60      0.5330      0.67  . Q       .         .         .         .
16.75      0.5407      0.57  . Q       .         .         .         .
16.90      0.5473      0.50  .Q        .         .         .         .
17.05      0.5531      0.45  .Q        .         .         .         .
17.20      0.5587      0.45  .Q        .         .         .         .
17.35      0.5640      0.42  .Q        .         .         .         .
17.50      0.5690      0.39  .Q        .         .         .         .
17.65      0.5737      0.37  .Q        .         .         .         .
17.80      0.5781      0.35  .Q        .         .         .         .
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 17.95      0.5823      0.33  .Q         .         .         .         .
 18.10      0.5863      0.32  .Q         .         .         .         .
 18.25      0.5903      0.32  .Q         .         .         .         .
 18.40      0.5942      0.31  .Q         .         .         .         .
 18.55      0.5980      0.30  .Q         .         .         .         .
 18.70      0.6016      0.29  .Q         .         .         .         .
 18.85      0.6052      0.28  .Q         .         .         .         .
 19.00      0.6086      0.27  .Q         .         .         .         .
 19.15      0.6119      0.27  .Q         .         .         .         .
 19.30      0.6152      0.26  .Q         .         .         .         .
 19.45      0.6183      0.25  .Q         .         .         .         .
 19.60      0.6214      0.25  Q          .         .         .         .
 19.75      0.6245      0.24  Q          .         .         .         .
 19.90      0.6274      0.24  Q          .         .         .         .
 20.05      0.6303      0.23  Q          .         .         .         .
 20.20      0.6331      0.23  Q          .         .         .         .
 20.35      0.6359      0.22  Q          .         .         .         .
 20.50      0.6386      0.22  Q          .         .         .         .
 20.65      0.6413      0.21  Q          .         .         .         .
 20.80      0.6439      0.21  Q          .         .         .         .
 20.95      0.6465      0.21  Q          .         .         .         .
 21.10      0.6490      0.20  Q          .         .         .         .
 21.25      0.6515      0.20  Q          .         .         .         .
 21.40      0.6540      0.20  Q          .         .         .         .
 21.55      0.6564      0.19  Q          .         .         .         .
 21.70      0.6587      0.19  Q          .         .         .         .
 21.85      0.6611      0.19  Q          .         .         .         .
 22.00      0.6634      0.19  Q          .         .         .         .
 22.15      0.6657      0.18  Q          .         .         .         .
 22.30      0.6679      0.18  Q          .         .         .         .
 22.45      0.6701      0.18  Q          .         .         .         .
 22.60      0.6723      0.18  Q          .         .         .         .
 22.75      0.6745      0.17  Q          .         .         .         .
 22.90      0.6766      0.17  Q          .         .         .         .
 23.05      0.6787      0.17  Q          .         .         .         .
 23.20      0.6808      0.17  Q          .         .         .         .
 23.35      0.6829      0.17  Q          .         .         .         .
 23.50      0.6849      0.16  Q          .         .         .         .
 23.65      0.6870      0.16  Q          .         .         .         .
 23.80      0.6890      0.16  Q          .         .         .         .
 23.95      0.6909      0.16  Q          .         .         .         .
 24.10      0.6929      0.16  Q          .         .         .         .
 24.25      0.6939      0.00  Q          .         .         .         .
-----------------------------------------------------------------------------
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                Duration
        Peak Flow Rate                    (minutes)
    =======================                =========
              0%                            1440.0
             10%                              81.0
             20%                              27.0
             30%                              18.0
             40%                               9.0
             50%                               9.0
             60%                               9.0
             70%                               9.0
             80%                               9.0
             90%                               9.0
```

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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                           Analysis prepared by:





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 Problem Descriptions:
  Maverick Victorville
  Drainage Area B
  100-year Storm Event
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC III:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     4.51 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1          3.95       13.00       32.(AMC II)     0.742       0.842

    TOTAL AREA (Acres) =      3.95
                               _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.096
                                       _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.158
============================================================================

 Problem Descriptions:
  Maverick Victorville
  Drainage Area B
  100-year Storm Event
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    3.95
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.096
    LOW LOSS FRACTION = 0.158
    TIME OF CONCENTRATION(MIN.) =  9.00
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) = 100
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.36
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.89
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.13
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.73
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.33
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.51

----------------------------------------------------------------------------
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    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.27
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.21

****************************************************************************
  TIME     VOLUME       Q     0.        5.0      10.0      15.0      20.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.10      0.0000      0.00  Q         .         .         .         .
  0.25      0.0019      0.30  Q         .         .         .         .
  0.40      0.0056      0.30  Q         .         .         .         .
  0.55      0.0093      0.30  Q         .         .         .         .
  0.70      0.0131      0.30  Q         .         .         .         .
  0.85      0.0168      0.31  Q         .         .         .         .
  1.00      0.0206      0.31  Q         .         .         .         .
  1.15      0.0244      0.31  Q         .         .         .         .
  1.30      0.0283      0.31  Q         .         .         .         .
  1.45      0.0321      0.31  Q         .         .         .         .
  1.60      0.0360      0.31  Q         .         .         .         .
  1.75      0.0399      0.32  Q         .         .         .         .
  1.90      0.0438      0.32  Q         .         .         .         .
  2.05      0.0477      0.32  Q         .         .         .         .
  2.20      0.0517      0.32  Q         .         .         .         .
  2.35      0.0557      0.32  Q         .         .         .         .
  2.50      0.0597      0.32  Q         .         .         .         .
  2.65      0.0637      0.33  Q         .         .         .         .
  2.80      0.0678      0.33  Q         .         .         .         .
  2.95      0.0718      0.33  Q         .         .         .         .
  3.10      0.0759      0.33  Q         .         .         .         .
  3.25      0.0800      0.33  Q         .         .         .         .
  3.40      0.0842      0.34  Q         .         .         .         .
  3.55      0.0884      0.34  Q         .         .         .         .
  3.70      0.0926      0.34  Q         .         .         .         .
  3.85      0.0968      0.34  Q         .         .         .         .
  4.00      0.1011      0.34  Q         .         .         .         .
  4.15      0.1053      0.35  Q         .         .         .         .
  4.30      0.1096      0.35  Q         .         .         .         .
  4.45      0.1140      0.35  Q         .         .         .         .
  4.60      0.1184      0.35  Q         .         .         .         .
  4.75      0.1227      0.36  Q         .         .         .         .
  4.90      0.1272      0.36  Q         .         .         .         .
  5.05      0.1316      0.36  Q         .         .         .         .
  5.20      0.1361      0.36  Q         .         .         .         .
  5.35      0.1407      0.37  Q         .         .         .         .
  5.50      0.1452      0.37  Q         .         .         .         .
  5.65      0.1498      0.37  Q         .         .         .         .
  5.80      0.1544      0.37  Q         .         .         .         .
  5.95      0.1591      0.38  Q         .         .         .         .
  6.10      0.1638      0.38  Q         .         .         .         .
  6.25      0.1685      0.38  Q         .         .         .         .
  6.40      0.1733      0.39  Q         .         .         .         .
  6.55      0.1781      0.39  Q         .         .         .         .
  6.70      0.1829      0.39  Q         .         .         .         .
  6.85      0.1878      0.40  Q         .         .         .         .
  7.00      0.1928      0.40  Q         .         .         .         .
  7.15      0.1977      0.40  Q         .         .         .         .
  7.30      0.2028      0.41  Q         .         .         .         .
  7.45      0.2078      0.41  Q         .         .         .         .
  7.60      0.2129      0.41  Q         .         .         .         .
  7.75      0.2181      0.42  Q         .         .         .         .
  7.90      0.2233      0.42  Q         .         .         .         .
  8.05      0.2285      0.43  Q         .         .         .         .
  8.20      0.2339      0.43  Q         .         .         .         .
  8.35      0.2392      0.44  Q         .         .         .         .
```

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 8.50      0.2446      0.44  Q         .         .         .         .
 8.65      0.2501      0.44  Q         .         .         .         .
 8.80      0.2556      0.45  Q         .         .         .         .
 8.95      0.2612      0.45  Q         .         .         .         .
 9.10      0.2669      0.46  Q         .         .         .         .
 9.25      0.2726      0.46  Q         .         .         .         .
 9.40      0.2784      0.47  Q         .         .         .         .
 9.55      0.2842      0.48  Q         .         .         .         .
 9.70      0.2901      0.48  Q         .         .         .         .
 9.85      0.2961      0.49  Q         .         .         .         .
10.00      0.3022      0.49  Q         .         .         .         .
10.15      0.3083      0.50  Q         .         .         .         .
10.30      0.3145      0.50  .Q        .         .         .         .
10.45      0.3208      0.51  .Q        .         .         .         .
10.60      0.3272      0.52  .Q        .         .         .         .
10.75      0.3337      0.53  .Q        .         .         .         .
10.90      0.3403      0.53  .Q        .         .         .         .
11.05      0.3470      0.54  .Q        .         .         .         .
11.20      0.3538      0.55  .Q        .         .         .         .
11.35      0.3607      0.56  .Q        .         .         .         .
11.50      0.3677      0.57  .Q        .         .         .         .
11.65      0.3748      0.58  .Q        .         .         .         .
11.80      0.3821      0.59  .Q        .         .         .         .
11.95      0.3895      0.60  .Q        .         .         .         .
12.10      0.3970      0.61  .Q        .         .         .         .
12.25      0.4043      0.57  .Q        .         .         .         .
12.40      0.4114      0.58  .Q        .         .         .         .
12.55      0.4186      0.59  .Q        .         .         .         .
12.70      0.4261      0.60  .Q        .         .         .         .
12.85      0.4337      0.62  .Q        .         .         .         .
13.00      0.4415      0.64  .Q        .         .         .         .
13.15      0.4495      0.66  .Q        .         .         .         .
13.30      0.4578      0.67  .Q        .         .         .         .
13.45      0.4663      0.70  .Q        .         .         .         .
13.60      0.4751      0.72  .Q        .         .         .         .
13.75      0.4842      0.75  .Q        .         .         .         .
13.90      0.4936      0.77  .Q        .         .         .         .
14.05      0.5034      0.81  .Q        .         .         .         .
14.20      0.5132      0.76  .Q        .         .         .         .
14.35      0.5228      0.81  .Q        .         .         .         .
14.50      0.5330      0.84  .Q        .         .         .         .
14.65      0.5438      0.91  .Q        .         .         .         .
14.80      0.5553      0.95  .Q        .         .         .         .
14.95      0.5676      1.04  . Q       .         .         .         .
15.10      0.5809      1.10  . Q       .         .         .         .
15.25      0.5956      1.26  . Q       .         .         .         .
15.40      0.6118      1.36  . Q       .         .         .         .
15.55      0.6292      1.46  . Q       .         .         .         .
15.70      0.6486      1.67  .  Q      .         .         .         .
15.85      0.6822      3.75  .      Q  .         .         .         .
16.00      0.7364      4.99  .        Q.         .         .         .
16.15      0.8441     12.39  .         .         .   Q     .         .
16.30      0.9354      2.35  .   Q     .         .         .         .
16.45      0.9584      1.36  . Q       .         .         .         .
16.60      0.9741      1.17  . Q       .         .         .         .
16.75      0.9876      0.99  .Q        .         .         .         .
16.90      0.9991      0.87  .Q        .         .         .         .
17.05      1.0093      0.78  .Q        .         .         .         .
17.20      1.0191      0.79  .Q        .         .         .         .
17.35      1.0285      0.73  .Q        .         .         .         .
17.50      1.0373      0.69  .Q        .         .         .         .
17.65      1.0456      0.65  .Q        .         .         .         .
17.80      1.0534      0.61  .Q        .         .         .         .
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 17.95      1.0608      0.58  .Q        .         .         .         .
 18.10      1.0679      0.56  .Q        .         .         .         .
 18.25      1.0751      0.60  .Q        .         .         .         .
 18.40      1.0823      0.58  .Q        .         .         .         .
 18.55      1.0893      0.56  .Q        .         .         .         .
 18.70      1.0961      0.54  .Q        .         .         .         .
 18.85      1.1027      0.52  .Q        .         .         .         .
 19.00      1.1091      0.51  .Q        .         .         .         .
 19.15      1.1153      0.50  Q         .         .         .         .
 19.30      1.1214      0.48  Q         .         .         .         .
 19.45      1.1273      0.47  Q         .         .         .         .
 19.60      1.1331      0.46  Q         .         .         .         .
 19.75      1.1388      0.45  Q         .         .         .         .
 19.90      1.1443      0.44  Q         .         .         .         .
 20.05      1.1497      0.43  Q         .         .         .         .
 20.20      1.1550      0.42  Q         .         .         .         .
 20.35      1.1602      0.42  Q         .         .         .         .
 20.50      1.1653      0.41  Q         .         .         .         .
 20.65      1.1703      0.40  Q         .         .         .         .
 20.80      1.1753      0.39  Q         .         .         .         .
 20.95      1.1801      0.39  Q         .         .         .         .
 21.10      1.1849      0.38  Q         .         .         .         .
 21.25      1.1896      0.38  Q         .         .         .         .
 21.40      1.1942      0.37  Q         .         .         .         .
 21.55      1.1988      0.36  Q         .         .         .         .
 21.70      1.2033      0.36  Q         .         .         .         .
 21.85      1.2077      0.35  Q         .         .         .         .
 22.00      1.2121      0.35  Q         .         .         .         .
 22.15      1.2164      0.35  Q         .         .         .         .
 22.30      1.2206      0.34  Q         .         .         .         .
 22.45      1.2248      0.34  Q         .         .         .         .
 22.60      1.2290      0.33  Q         .         .         .         .
 22.75      1.2331      0.33  Q         .         .         .         .
 22.90      1.2371      0.32  Q         .         .         .         .
 23.05      1.2411      0.32  Q         .         .         .         .
 23.20      1.2451      0.32  Q         .         .         .         .
 23.35      1.2490      0.31  Q         .         .         .         .
 23.50      1.2529      0.31  Q         .         .         .         .
 23.65      1.2567      0.31  Q         .         .         .         .
 23.80      1.2605      0.30  Q         .         .         .         .
 23.95      1.2642      0.30  Q         .         .         .         .
 24.10      1.2680      0.30  Q         .         .         .         .
 24.25      1.2698      0.00  Q         .         .         .         .
 -----------------------------------------------------------------------------
-------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated               Duration
        Peak Flow Rate                    (minutes)
    =======================               =========
              0%                           1440.0
             10%                             81.0
             20%                             27.0
             30%                             27.0
             40%                             18.0
             50%                              9.0
             60%                              9.0
             70%                              9.0
             80%                              9.0
             90%                              9.0
```

Infiltration System Sizing and Draw Down Time

Victorville Nisqualli
Drawdown Calculations

BMP #1 - ADS StormTech MC-4500 System	
Infiltration Rate (in/hr)	10
FS	3
Infiltration Rate (in/hr)	3.33
Surface Area of StormTech System (sf)	7766
Volume Provided within StormTech System (cf)	33377
Volume Required(cf)	33111
Volume Provided>Volume Required	
Drawdown Time (hr) < 48 hrs	**15**

BMP 2 - Infiltration Basin	
Basin Size	
Infiltration Rate (in/hr)	40
Factor of Safety, FS	3
Design Infiltration Rate, Pdesign (in/hr)	13
Infiltrating Surface Area, Sainf (sf)	402
Drawdown Time, Td (hrs)	48
Time to fill, Tf (hrs)	3
Retained Volume, Vret (cf)	22211
Volume Required (cf)	55321
Meets Requirements	FALSE
Actual Drawdown Time (hr)	**48**
Remaining volume required underground (cf)	33111

BMP 3 - Infiltration Basin	
Basin Size	
Infiltration Rate (in/hr)	40
Factor of Safety, FS	3
Design Infiltration Rate, Pdesign (in/hr)	13
Infiltrating Surface Area, Sainf (sf)	458
Drawdown Time, Td (hrs)	48
Time to fill, Tf (hrs)	3
Retained Volume, Vret (cf)	25305
Volume Required (cf)	8712
Meets Requirements	TRUE
Actual Drawdown Time (hr)	**15**

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

ADVANCED DRAINAGE SYSTEMS, INC.

SiteASSIST™ by StormTech

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MAVERICK VICTORVILLE

VICTORVILLE, CA

MC-4500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-4500.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/IN/IN. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-4500 CHAMBER SYSTEM

1. STORMTECH MC-4500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS SO AS NOT TO DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 12" (300 mm) BETWEEN ADJACENT CHAMBER ROWS.
10. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
11. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIAL BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
12. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-4500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT		CONCEPTUAL ELEVATIONS	
189	STORMTECH MC-4500 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	12.75
14	STORMTECH MC-4500 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	8.25
12	STONE ABOVE (in)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	7.75
9	STONE BELOW (in)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	7.75
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	7.75
33377	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	6.75
		TOP OF MC-4500 CHAMBER:	5.75
		24" x 24" BOTTOM MANIFOLD INVERT:	0.94
		24" ISOLATOR ROW PLUS INVERT:	0.94
7766	SYSTEM AREA (SF)	BOTTOM OF MC-4500 CHAMBER:	0.75
370.9	SYSTEM PERIMETER (ft)	BOTTOM OF STONE:	0.00

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	24" BOTTOM PARTIAL CUT END CAP, PART#: MC4500IEPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26"	
FLAMP	B	INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MC450024RAMP		
MANIFOLD	C	24" x 24" BOTTOM MANIFOLD, ADS N-12	2.26"	
CONCRETE STRUCTURE W/WEIR	D	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		41.5 CFS IN

ISOLATOR ROW PLUS (SEE DETAIL)

PLACE MINIMUM 17.50' OF ADSPLUS175 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

MAVERICK VICTORVILLE

VICTORVILLE, CA

DATE:

DRAWN: GC

PROJECT #:

CHECKED: N/A

REV	DRW	CHK	DESCRIPTION

StormTech
Detention • Retention • Water Quality
520 CROMWELL AVENUE | ROCKY HILL | CT | 06067
860-529-8188 | 888-892-2694 | WWW.STORMTECH.COM

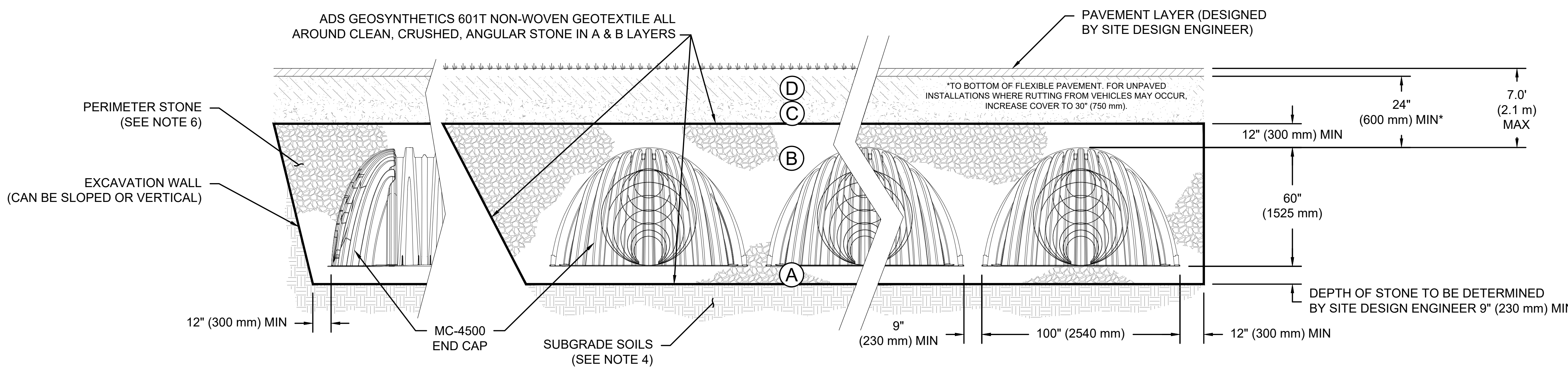
ADS
ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

0 10' 20'

ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-4500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/IN/IN. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

MAVERICK VICTORVILLE
VICTORVILLE, CA

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CHECKED: N/A
DATE:
PROJECT #:

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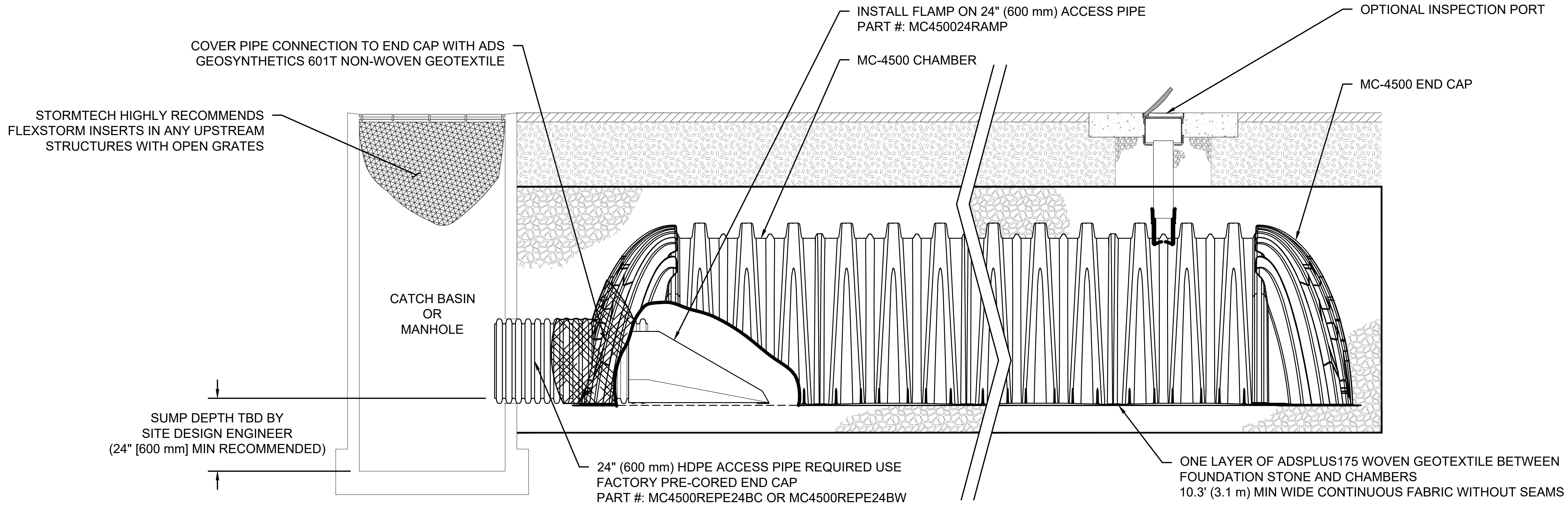

MC-4500 ISOLATOR ROW PLUS DETAIL

NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.

2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

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MC-4500 TECHNICAL SPECIFICATION

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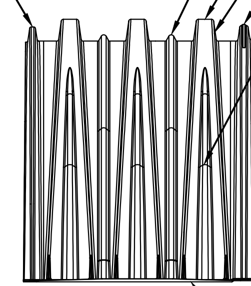
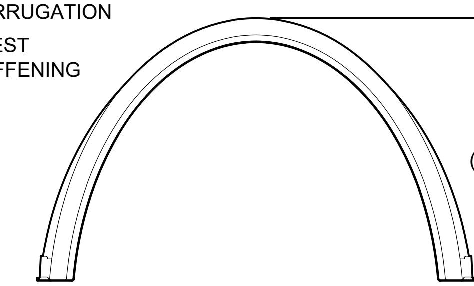
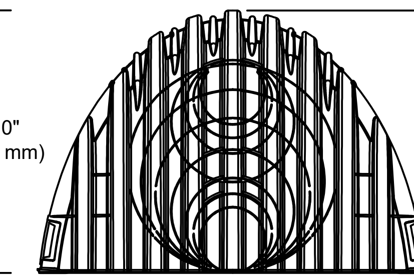
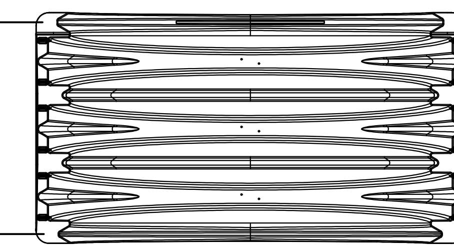
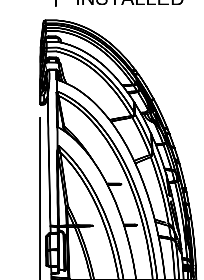










NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 mm X 1524 mm X 1227 mm)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m³)
MINIMUM INSTALLED STORAGE*	162.6 CUBIC FEET	(4.60 m³)
WEIGHT (NOMINAL)	125.0 lbs.	(56.7 kg)

NOMINAL END CAP SPECIFICATIONS

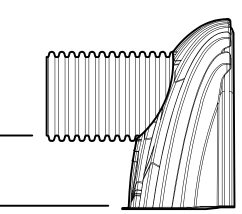
SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.8"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

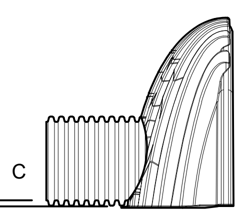
*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC4500IEPP06T	6" (150 mm)	42.54" (1081 mm)	---
MC4500IEPP06B		---	0.86" (22 mm)
MC4500IEPP08T	8" (200 mm)	40.50" (1029 mm)	---
MC4500IEPP08B		---	1.01" (26 mm)
MC4500IEPP10T	10" (250 mm)	38.37" (975 mm)	---
MC4500IEPP10B		---	1.33" (34 mm)
MC4500IEPP12T	12" (300 mm)	35.69" (907 mm)	---
MC4500IEPP12B		---	1.55" (39 mm)
MC4500IEPP15T	15" (375 mm)	32.72" (831 mm)	---
MC4500IEPP15B		---	1.70" (43 mm)
MC4500IEPP18T	18" (450 mm)	29.36" (746 mm)	---
MC4500IEPP18TW			
MC4500IEPP18B		---	1.97" (50 mm)
MC4500IEPP18BW			
MC4500IEPP24T	24" (600 mm)	23.05" (585 mm)	---
MC4500IEPP24TW			
MC4500IEPP24B		---	2.26" (57 mm)
MC4500IEPP24BW			
MC4500IEPP30BW	30" (750 mm)	---	2.95" (75 mm)
MC4500IEPP36BW	36" (900 mm)	---	3.25" (83 mm)
MC4500IEPP42BW	42" (1050 mm)	---	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL

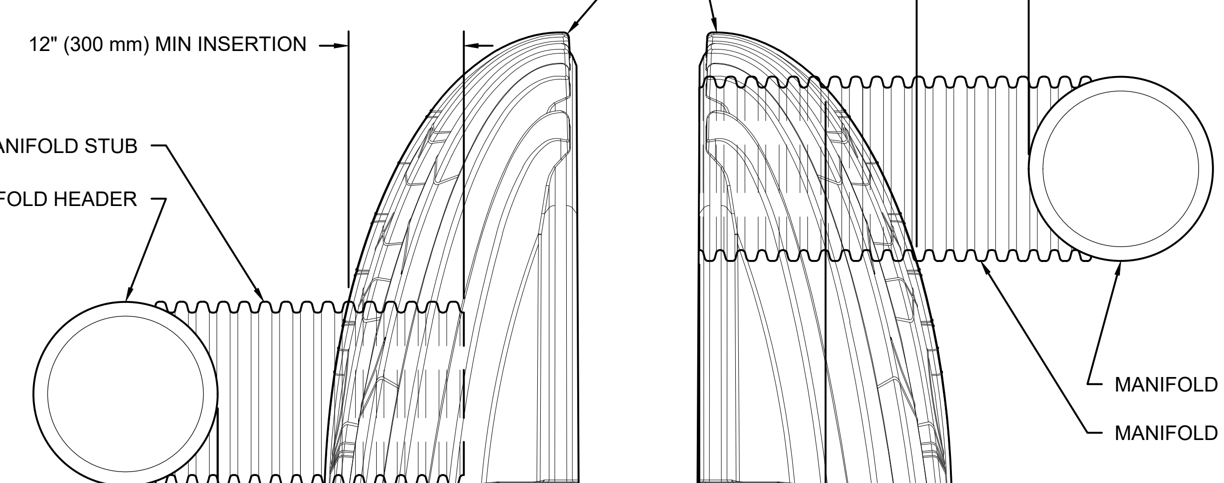




CUSTOM PARTIAL CUT INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-4500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

MC-SERIES END CAP INSERTION DETAIL

NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

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APPENDIX D

- Geotechnical Engineering Investigation Report
  - Prepared by: Krazan & Associates, Inc.
  - Project Number: 112-18075
  - Date Prepared: July 31, 2018
- United States Department of Agriculture Natural Resources Conservation Service Soil Survey Map

ENGINEERING •GEOTECHNICAL •ENVIRONMENTAL (ESA I & II) • MATERIALS TESTING •SPECIAL INSPECTIONS • ORGANIC CHEMISTRY • PAVEMENT DESIGN •GEOLOGY

GEOTECHNICAL ENGINEERING STUDY

Proposed Maverik Store

NWC of Mariposa Road and Nisqualli Road
Victorville, California

CMT PROJECT NO. 15198

FOR:
Cardno, Inc.
1142 West 2320 South, Suite A
West Valley City, Utah 84119

September 10, 2020

CMT ENGINEERING LABORATORIES

September 10, 2020

Mr. Russ Hamblin
Cardno, Inc.
1142 West 2320 South, Suite A
West Valley City, Utah 84119

Subject: Geotechnical Engineering Study
Proposed Maverik Store
NWC of Mariposa Road & Nisqualli Road
Victorville, California
CMT Project Number: 15198

Mr. Hamblin:

Submitted herewith is the report of our geotechnical engineering study for the subject site. This report contains the results of our findings and an engineering interpretation of the results with respect to the available project characteristics. It also contains recommendations to aid in the design and construction of the earth related phases of this project.

On August 22, 2020, a total of 6 bore holes were drilled at the site extending to depths between about 5.0 to 71.5 feet below the existing ground surface. Soil samples were obtained in the bore holes during the field operations and subsequently transported to our laboratory for further testing and observation.

Natural soils consisted of SAND (SM, SP-SM), and an occasional CLAY (CL) or SILT (ML) layer. Groundwater was not encountered within the bore holes. Based upon the results of our study the proposed structures may be supported on conventional strip and spread footings founded entirely on suitable, undisturbed natural soils, or on engineered fill extending to natural soils. A detailed discussion of design and construction criteria is presented in this report.

We appreciate the opportunity to work with you at this stage of the project. CMT offers a full range of Geotechnical Engineering, Geological, Material Testing, Special Inspection services, and Phase I and II Environmental Site Assessments. With offices throughout Utah, Idaho, and Arizona, our staff is capable of efficiently serving your project needs. If we can be of further assistance or if you have any questions regarding this project, please do not hesitate to contact us at (801) 492-4132.

Sincerely,
CMT Engineering Laboratories

Jeffrey J. Egbert, P.E. (UT), LEED A.P., M. ASCE
Senior Geotechnical Engineer

Reviewed By:

REGISTERED PROFESSIONAL ENGINEER
WILLIAM G. TURNER
No. C 43740
Exp. 3/1/21
CIVIL
STATE OF CALIFORNIA

William G. Turner, P.E. (CA C43740)
Senior Geotechnical Engineer

CMT ENGINEERING LABORATORIES

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 General

CMT Engineering Laboratories (CMT) was retained to conduct a geotechnical subsurface study for a proposed Maverik Store. The site is situated at the northwest corner of the intersection of Mariposa Road and Nisqualli Road in Victorville, California as shown in the **Vicinity Map** below.

VICINITY MAP

1.2 Objectives, Scope and Authorization

The objectives and scope of our study were planned in communications between Mr. Russ Hamblin of Cardno, Inc., and Mr. Jeffrey Egbert of CMT Engineering Laboratories (CMT). In general, the objectives of this study were to define and evaluate the subsurface soil and groundwater conditions at the site, and provide appropriate foundation, earthwork, pavement and seismic recommendations to be utilized in the design and construction of the proposed development.

In accomplishing these objectives, field explorations were performed on the site by Cardno, which consisted of the drilling/logging/sampling of 6 bore holes. Our scope of work included performing laboratory testing on samples of the subsurface soils collected in the bore holes as provided to us, and conducting an office program which included correlating available data, performing engineering analyses, and preparing this summary report.

1.3 Description of Proposed Construction

We understand that the proposed construction consists of a new Maverik convenience store and fuel station with accompanying fuel islands and canopies, and underground fuel storage tanks. We project that wall loads for the store building will not exceed 4,000 pounds per linear foot. Floor slab loads are anticipated to be relatively light, with an average uniform loading not exceeding 150 pounds per square foot.

The fuel island canopies will be supported by steel frames and columns extending to the foundation system. It is projected that the maximum canopy downward column loads will be on the order of 60,000 pounds. In addition, uplift and lateral loads will be imposed upon these foundations.

If the loading conditions are different than we have projected, please notify us so that any appropriate modifications to our conclusions and recommendations contained herein can be made.

We also understand the parking/drive paved areas will utilize both asphalt and concrete pavement. Concrete pavement will likely be installed in front of the proposed store structure, as well as in the canopy fuel islands and over the underground storage tank area. In other areas, asphalt concrete sections will likely be used. Traffic is projected to consist of mostly automobiles and light trucks (1,100/day), a few daily medium-weight delivery trucks (2/day), multiple fuel delivery trucks and semi-trucks (50/day), a weekly garbage truck, and an occasional fire truck.

1.4 Executive Summary

The most significant geotechnical aspects regarding site development include the following:

1. Topsoil on the surface, about 6 inches in thickness, to be removed.
2. Subsurface natural soils consisted predominately of SAND (SC, SM, SP-SM), with occasional layers of CLAY (CL) and SILT (ML), extending to the bottom of the bore holes.
3. Groundwater was not encountered to the maximum depth explored of about 71.5 feet below the surface.
4. The potential for liquefaction to occur in the soils we encountered is low.
5. Conventional foundations for the proposed structures can be supported on suitable, undisturbed natural sand soils, or entirely on engineered fill placed on suitable, undisturbed natural soils.

A qualified geotechnical engineer must assess that non-engineered fill (if encountered), topsoil, debris, disturbed or unsuitable soils have been removed and that suitable soils have been encountered prior to placing structural/site grading fills, footings, slabs, and pavements.

In the following sections, detailed discussions pertaining to the site and subsurface descriptions, geologic/seismic setting, earthwork, foundations, lateral resistance, lateral pressure, floor slabs, and pavements are provided.

2.0 FIELD EXPLORATION

2.1 General

In order to define and evaluate the subsurface soil and groundwater conditions, 6 bore holes were drilled at the site to depths of approximately 5.0 to 71.5 feet below the existing ground surface. Locations of the bore holes are presented on **Figure 1**.

Samples of the subsurface soils encountered in the bore holes were collected at varying depths through the hollow stem drill augers. Relatively undisturbed samples of the subsurface soils were obtained by driving a split-spoon sampler with 2.5-inch outside diameter rings/liners into the undisturbed soils below the drill augers. Disturbed samples were collected utilizing a standard split spoon sampler. This standard split spoon sampler was driven 18 inches into the soils below the drill augers using a 140 pound hammer free-falling a distance of 30 inches. The number of hammer blows needed for each 6 inch interval was recorded. The sum of the hammer blows for the final 12 inches of penetration is known as a standard penetration test (SPT) and this 'blow count' was recorded on the bore hole logs. Where more than 50 blows occurred before the 6-inch interval was achieved, the sampling was terminated and the number of blows and inches penetrated by the sampler were recorded. The blow count provides a reasonable approximation of the relative density of granular soils, but only a limited indication of the relative consistency of fine grained soils because the consistency of these soils is significantly influenced by the moisture content.

The subsurface soil samples retrieved in the bore holes were classified in the field based upon visual and textural examination in general accordance with ASTM[1] D-2488. These field classifications were supplemented by subsequent examination and testing of select samples in our laboratory. Graphic logs of the bore holes, including a description of the soil strata encountered, are presented on the Bore Hole Logs, **Figures 2 through 7**, included in the Appendix. Sampling information and other pertinent data and observations are also included on the logs. In addition, a Key to Symbols defining the terms and symbols used on the logs is provided as **Figure 8** in the Appendix.

2.2 Infiltration Testing

Infiltration testing was also performed in bore hole B-6 within natural sand soils. The testing consisted of drilling to 5 feet below the surface, removing the auger, filling the hole with water, allowing it to soak for several hours, then filling the hole again and measuring the rate of water drop over a certain time period (i.e. every 15 minutes). The final measured rate was approximately 1.5 minutes per inch.

---

[1]American Society for Testing and Materials

3.0 LABORATORY TESTING

Selected samples of the subsurface soils were subjected to various laboratory tests to assess pertinent engineering properties, as follows:

1. Moisture Content, ASTM D-2216, Percent moisture representative of field conditions
2. Dry Density, ASTM D-2937, Dry unit weight representing field conditions
3. Atterberg Limits, ASTM D-4318, Plasticity and workability
4. Gradation Analysis, ASTM D-1140/C-117, Grain Size Analysis

Laboratory test results are presented on the bore hole logs (**Figures 2 through 7**) and in the following Lab Summary Table:

LAB SUMMARY TABLE

Bore Hole	Depth (feet)	Sample Type	Soil Class	Moisture Content (%)	Dry Denstiy (pcf)	Gradation			Atterberg Limits		
						Grav	Sand	Fines	LL	PL	PI
B-1	7	SPT	SC	9				41	30	19	11
	10	Rings	SC	5	121						
	20	SPT	SP-SM	1		18	75	7			
	50	SPT	SM	4				23			
	60	SPT	SM	3						NP	
B-2	5	Rings	SM	4	114			27			
	15	SPT	CL	6					27	19	8
B-3	2.5	SPT	SM	3				29			
	10	SPT	ML	5						NP	
B-4	4	SPT	SM	4				20			
B-5	0	SPT	SM	1				23			

4.0 GEOLOGIC & SEISMIC CONDITIONS

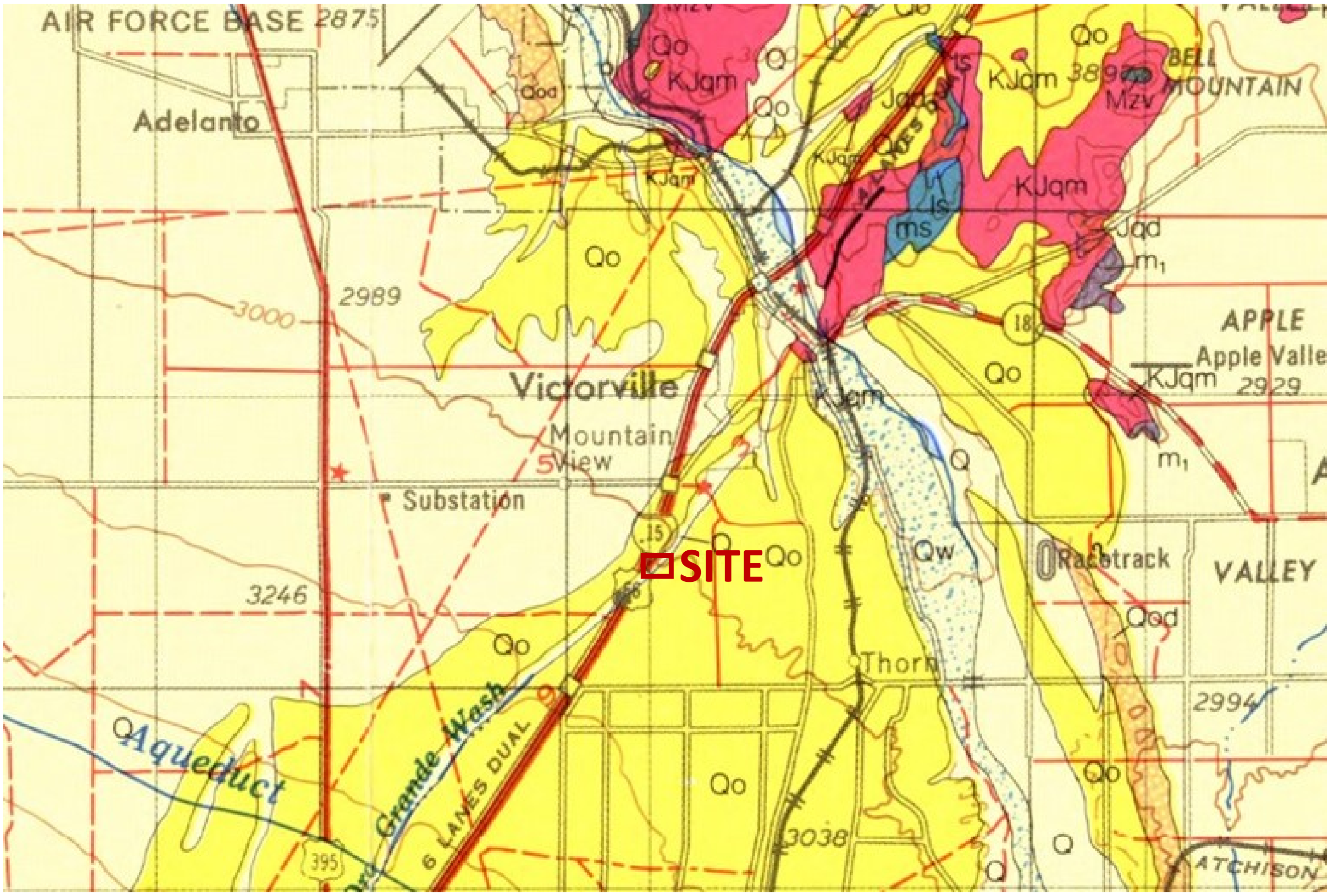
4.1 Geologic Setting

The subject site is located in the western portion of the Mojave Desert Geomorphic Province in southern California. The area of the subject site is a generally broad, flat area with interspersed hilly terrain and relatively low-relief mountains. The San Gabriel Mountains lie to the south of the area. The site sits at an elevation of approximately 3,066 feet above sea level.

The geology of the San Bernardino Sheet of the Geologic Map of California, that includes the location of the subject site, has been mapped by Bortugno and Spittler[2]. The geology at the location of the site and adjacent properties is mapped as “Older alluvium, undifferentiated” (Map Unit Qo) loosely dated as upper Pleistocene.

[2] Rogers, T.H., 1967, Geologic Map of the San Bernardino Quadrangle, California; California Division of Mines and Geology, Regional Geologic Map Series, Map No. 3A, Scale 1:250,000.

The referenced map does not provide a more detailed description of Unit Qo. Refer to the **Geologic Map**., shown below.



GEOLOGIC MAP

4.2 Faulting

An interactive hazards map from the California Geological Survey[3] was reviewed. No fault traces are shown on the referenced geologic map crossing, adjacent to, or projecting toward the subject site. The nearest mapped active (Holocene) fault appears to be the Ord Mountains Fault Zone approximately 9.3 miles to the southeast.

4.3 Seismicity

4.3.1 Site Class

We understand that the State of California Building Code (SCBC) 2019 was adopted on January 1, 2020, which we anticipate will be the code for design of the structures at this site. SCBC 2019 refers to Chapter 20, Site

[3] https://maps.conservation.ca.gov/cgs/DataViewer/

Classification Procedure for Seismic Design, of ASCE[4] 7-16, which stipulates that the average values of shear wave velocity, blow count and/or shear strength within the upper 100 feet (30 meters) be utilized to determine seismic site class. Based on average shear wave velocity data within the upper 30 meters ($V_{S,30}$) provided in the interactive hazards map from the California Geological Survey[3], the subject site has a $V_{S,30}$ of 293 meters per second (961 feet per second), which fits Site Class D. In addition, given the average blow counts and subsurface soils encountered within the maximum depth explored of 71.5 feet at the site, it is our opinion the site best fits Site Class D – Stiff Soil (with data), which we recommend for seismic structural design.

4.3.2 Ground Motions

The seismic mapping utilized by the California Building Code provides values of peak ground, short period and long period spectral accelerations for the Site Class B/C boundary and the Risk-Targeted Maximum Considered Earthquake (MCE_R). This Site Class B/C boundary represents average bedrock values for the Western United States and must be corrected for local soil conditions at site grid coordinates of 34.4861 degrees north latitude and -117.3331 degrees west longitude. The following table summarizes the peak ground, short period and long period accelerations for the MCE_R event, and incorporates appropriate soil correction factors for a Site Class D (with data) soil profile:

SPECTRAL ACCELERATION PERIOD, T	SITE CLASS B/C BOUNDARY [mapped values] (g)	SITE COEFFICIENT	SITE CLASS D* [adjusted for site class effects] (g)	MULTI-PLIER	DESIGN VALUES (g)
Peak Ground Acceleration	PGA = 0.500	F_{pga} = 1.100	PGA_M = 0.550	1.000	PGA_M = 0.550
0.2 Seconds (Long Period Acceleration)	S_S = 1.247	F_a = 1.001	S_{MS} = 1.248	0.667	S_{DS} = 0.832
	(no exceptions needed)	F_a = (N/A)	S_{MS} = (N/A)	0.667	S_{DS} = (N/A)
1.0 Second (Long Period Acceleration)	S_1 = 0.482	F_v = N/A	S_{M1} = N/A	0.667	S_{D1} = N/A
	(Exception 2:)	F_v = (1.818)	S_{M1} = (0.876)	0.667	S_{D1} = (0.584)

NOTES: 1. TL (seconds): 8 *** Site Class D With Data**
2. Site Class: D **4. ASCE 7-16 Requires Site-Specific Ground Motion Hazard Analysis (Since S1≥0.2 sec) - OR Can Use Exception 2 (per §11.4.8)**
3. Have data to verify? yes

As indicated in the above table, S_1 is greater than 0.2 seconds and a site-specific ground motion hazard analysis (GMHA) is required for the site, unless the Exception 2 values shown are used for seismic design. If a site-specific GMHA is desired instead of using the higher exception values, please contact CMT for a proposal to perform the GMHA.

4.3.3 Liquefaction

Liquefaction is defined as the condition when saturated, loose, sandy soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event. Clayey soils, even if saturated, will generally not liquefy during a major seismic event.

[4] American Society of Civil Engineers

Groundwater was not encountered to the maximum depth explored of 71.5 feet. Based upon this condition, we estimate a very low liquefaction potential or the soils we encountered at this site.

4.4 Other Geologic Hazards

No landslide deposits or features, including lateral spread deposits, are mapped on or adjacent to the site. The site is not located within a known or mapped potential debris flow, stream flooding[5], or rock fall hazard area.

5.0 SITE CONDITIONS

5.1 Surface Conditions

At the time the bore holes were drilled, the site was undeveloped land vegetated with grasses and weeds. The site grade was relatively flat and tens of feet below the adjacent roads. Based on aerial photos dating back to 1993 that are readily available on the internet, Mariposa Road was constructed between 2009 and 2013, and it appears the site grade was lowered as part of the construction. It has since remained undeveloped. The site is bordered on the north by undeveloped land, on the south by Nisqualli Road, on the east by Mariposa Road, and on the west by the northbound Interstate 15 on ramp (see **Vicinity Map** in **Section 1.1** above).

5.2 Subsurface Soils

Approximately 6 inches of sandy topsoil was encountered at the surface across the site. The natural soils encountered below the topsoil predominately consisted of Clayey SAND (SC), Silty SAND (SM), and Poorly Graded SAND with silt (SP-SM) layers. An occasional layer of CLAY (CL) or SILT (ML) was also encountered.

The natural sand soils were slightly moist, red-brown/brown/light brown/light gray-brown in color, and appear to range in relative density from medium dense to very dense based upon the SPT blow counts.

The clay and silt layers were slightly moist to moist, brown to light brown in color, and of medium stiff (estimated) to hard consistency based upon the SPT blow counts.

For a more descriptive interpretation of subsurface conditions, please refer to the bore hole logs, **Figures 2 through 7**, which graphically represent the subsurface conditions encountered. The lines designating the interface between soil types on the log generally represent approximate boundaries; in situ, the transition between soil types may be gradual.

5.3 Groundwater

Groundwater was not encountered to the maximum depth explored of approximately 71.5 feet below the surface. Based upon this condition we do not expect groundwater to be encountered during construction.

[5] https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd&extent=-111.36752238312305,40.474000783564726,-111.34675135651116,40.48216171946493

Groundwater levels can fluctuate seasonally and in response to numerous factors such as heavy precipitation, irrigation of neighboring land, and other unforeseen factors. The detailed evaluation of these and other factors, which may be responsible for ground water fluctuations, is beyond the scope of this study.

5.4 Site Subsurface Variations

Based on the results of the subsurface explorations and our experience, variations in the continuity and nature of subsurface conditions should be anticipated. Due to the heterogeneous characteristics of natural soils, care should be taken in interpolating or extrapolating subsurface conditions between or beyond the exploratory locations.

6.0 SITE PREPARATION AND GRADING

6.1 General

All deleterious materials should be stripped from the site prior to commencement of construction activities. This includes loose and disturbed soils, topsoil, vegetation, etc. Based upon the conditions observed in the bore holes there is topsoil on the surface of the site which we estimated to be about 6 inches in thickness. When stripping and grubbing, topsoil should be distinguished by the apparent organic content and not solely by color; thus we estimate that topsoil stripping will need to include at least the upper 4 inches.

In pavement areas we recommend that the subgrade be proofrolled by passing moderate-weight rubber tire-mounted construction equipment over the surface at least twice. If excessively soft or loose soils are encountered, they must be removed (up to a maximum depth of 2 feet) and replaced with structural fill. The removed soils may then be replaced as properly moisture conditioned (to within 0 to 2% above optimum moisture) and compacted structural fill, or imported structural fill may be used.

Fill placed over large areas to raise overall site grades can induce settlements in the underlying natural soils. If more than 3 feet of site grading fill is anticipated over the existing ground surface, we should be notified to assess potential settlements and provide additional recommendations as needed. These recommendations may include placement of the site grading fill far in advance to allow potential settlements to occur prior to construction.

6.2 Temporary Excavations

Excavations up to 16 feet deep for the underground fuel storage tanks are anticipated at the site.

For sandy (cohesionless) soils, temporary construction excavations not exceeding 4 feet in depth should be no steeper than one-half horizontal to one vertical (0.5H:1V). For excavations up to 16 feet and above groundwater, side slopes should be no steeper than one horizontal to one vertical (1H:1V). Excavations encountering saturated cohesionless soils will be very difficult to maintain, and will require very flat side slopes and/or shoring, bracing and dewatering.

In clay (cohesive) soils, temporary construction excavations not exceeding 4 feet in depth may be constructed with near-vertical side slopes. Temporary excavations up to 16 feet deep, above or below groundwater, may be constructed with side slopes no steeper than one horizontal to one vertical (1H:1V).

All excavations must be inspected periodically by qualified personnel. If any signs of instability or excessive sloughing are noted, immediate remedial action must be initiated. All excavations should be made following OSHA safety guidelines.

6.3 Fill Material

The table below contains our recommendations for the various fill types we anticipate will be used at this site:

FILL MATERIAL TYPE	DESCRIPTION | RECOMMENDED SPECIFICATION
Structural Fill	Placed below structures, flatwork and pavement. Well-graded sand/gravel mixture, with maximum particle size of 4 inches, a minimum 70% passing 3/4-inch sieve, a maximum 20% passing the No. 200 sieve, and a maximum Plasticity Index of 10.
Site Grading Fill	Placed over larger areas to raise the site grade. Sandy to gravelly soil, with a maximum particle size of 6 inches, a minimum 70% passing 3/4-inch sieve, a maximum 50% passing No. 200 sieve and a maximum Plasticity Index of 15.
Non-Structural Fill	Placed below non-structural areas, such as landscaping. On-site soils or imported soils, with a maximum particle size of 8 inches, including silt/clay soils not containing excessive amounts of degradable/organic material (see discussion below).
Stabilization Fill	Placed to stabilize soft areas prior to placing structural fill and/or site grading fill. Coarse angular gravels and cobbles 1 inch to 8 inches in size. May also use 1.5- to 2.0-inch gravel placed on stabilization fabric, such as Mirafi RS280i or equivalent (see **Section 6.6**).

The natural sand soils (SM, SP-SM) at this site may be suitable for use as structural fill and site grading fill, if found to meet the specifications given above. All on-site soils could be used as non-structural fill but the finer grained soils (CL, ML) could be more difficult to work with. If utilized, these soils should be compacted to the same requirements as imported engineered fill as recommended below.

All fill material should be approved by a geotechnical engineer prior to placement.

6.4 Fill Placement and Compaction

The various types of compaction equipment available have their limitations as to the maximum lift thickness that can be compacted. For example, hand operated equipment is limited to lifts of about 4 inches and most "trench compactors" have a maximum, consistent compaction depth of about 6 inches. Large rollers, depending on soil and moisture conditions, can achieve compaction at 8 to 12 inches. The full thickness of each lift should be compacted to at least the following percentages of the maximum dry density as determined by ASTM D-1557 (or AASHTO[6] T-180) in accordance with the following recommendations:

[6] American Association of State Highway and Transportation Officials

LOCATION	TOTAL FILL THICKNESS (FEET)	MINIMUM PERCENTAGE OF MAXIMUM DRY DENSITY
Beneath an area extending at least 4 feet beyond the perimeter of structures, and below flatwork and pavement (applies to structural fill and site grading fill) extending at least 2 feet beyond the perimeter	0 to 6	95
Site grading fill outside area defined above	0 to 6	92
Utility trenches within structural areas	--	96
Roadbase and subbase	-	96
Non-structural fill	0 to 6	90

Structural fills greater than 6 feet thick are not anticipated at the site. For best compaction results, we recommend that the moisture content for structural fill/backfill be within 2% of optimum. Field density tests should be performed on each lift as necessary to verify that proper compaction is being achieved.

6.5 Utility Trenches

For the bedding zone around the utility, we recommend utilizing sand bedding fill material that meets current local or APWA[7] requirements.

All utility trench backfill material below structurally loaded facilities (foundations, floor slabs, flatwork, parking lots/drive areas, etc.) should be placed at the same density requirements established for structural fill in the previous section.

Most utility companies and local governments are requiring Type A-1a or A-1b (AASHTO Designation) soils (sand/gravel soils with limited fines) be used as backfill over utilities within public rights of way, and the backfill be compacted over the full depth above the bedding zone to at least 96% of the maximum dry density as determined by AASHTO T-180 (ASTM D-1557).

6.6 Stabilization

If rutting or pumping occurs, traffic should be stopped and the disturbed soils should be removed and replaced with stabilization material. Typically, a minimum of 18 inches of the disturbed soils must be removed to be effective. However, deeper removal is sometimes required.

To stabilize soft subgrade conditions a mixture of coarse, clean, angular gravels and cobbles and/or 1.5- to 2.0-inch clean gravel should be utilized. Often the amount of gravelly material can be reduced with the use of a geotextile fabric such as Mirafi RS280i, or equivalent. Its use will also help avoid mixing of the subgrade soils with the gravelly material. After excavating the soft/disturbed soils, the fabric should be spread across the bottom of the excavation and up the sides a minimum of 18 inches. Otherwise, it should be placed in accordance

[7] American Public Works Association

with the manufacturer's recommendation, including proper overlaps. The gravel material can then be placed over the fabric in compacted lifts as described above.

7.0 FOUNDATION RECOMMENDATIONS

The following recommendations have been developed on the basis of the previously described project characteristics, the subsurface conditions observed in the field and the laboratory test data, as well as common geotechnical engineering practice.

7.1 Foundation Recommendations

Based on our geotechnical engineering analyses, the proposed structures may be supported upon conventional spread and/or continuous wall foundations placed entirely on suitable undisturbed natural sand soils, or entirely on structural fill extending to undisturbed natural soils. Footings may be designed using a net bearing pressure of 2,000 psf. The term "net bearing pressure" refers to the pressure imposed by the portion of the structure located above lowest adjacent final grade, thus the weight of the footing and backfill to lowest adjacent final grade need not be considered. The allowable bearing pressure may be increased by 1/3 for temporary loads such as wind and seismic forces.

We also recommend the following:

1. Exterior footings subject to frost should be placed at least 12 inches below final grade.
2. Interior footings not subject to frost should be placed at least 8 inches below grade.
3. Continuous footing widths should be maintained at a minimum of 18 inches.
4. Spot footings should be a minimum of 24 inches wide.

7.2 Installation

Under no circumstances shall foundations be placed on non-engineered fill (if encountered), topsoil with organics, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. If unsuitable soils are encountered, they must be completely removed and replaced with properly compacted structural fill. The base of footing excavations and floor slab sub grades should be observed by a qualified geotechnical engineer to confirm that suitable bearing soils have been exposed.

All structural fill should meet the requirements for such, and should be placed and compacted in accordance with **Section 6** above. The width of structural replacement fill below footings should be equal to the width of the footing plus 1 foot for each foot of fill thickness. For instance, if the footing width is 2 feet and the structural fill depth beneath the footing is 4 feet, the fill replacement width should be 6 feet, centered beneath the footing.

The minimum thickness of structural fill below footings should be equivalent to one-third the thickness of structural fill below any other portion of the foundations. For example, if the maximum depth of structural fill is 6 feet, all footings for the new structure should be underlain by a minimum 2 feet of structural fill.

7.3 Estimated Settlement

Foundations designed and constructed in accordance with our recommendations could experience some settlement, but we anticipate that total settlements of footings founded as recommended above will not exceed 1 inch. We project that approximately 50% of the total settlement will initially take place during construction.

7.4 Lateral Resistance

Lateral loads imposed upon foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footings and the supporting soils. In determining frictional resistance, a coefficient of 0.40 for structural fill, may be utilized for design. Passive resistance provided by properly placed and compacted structural fill above the water table may be considered equivalent to a fluid with a density of 425 pcf. A combination of passive earth resistance and friction may be utilized if the friction component of the total is divided by 1.5.

8.0 LATERAL EARTH PRESSURES

We anticipate that below-grade walls up to 4 feet high may be constructed at this site. The lateral earth pressure values given in the table below are for a backfill material that will consist of drained sand/gravel soils (less than 10% passing No. 200 sieve) placed and compacted in accordance with the recommendations presented herein. If other soil types will be used as backfill, we should be notified so that appropriate modifications to these values can be provided, as needed.

The lateral pressures imposed upon subgrade facilities will depend upon the relative rigidity and movement of the backfilled structure. Following are the recommended lateral pressure values, which also assume that the soil surface behind the wall is horizontal and that the backfill within 3 feet of the wall will be compacted with hand-operated compacting equipment.

CONDITION	STATIC (psf/ft)*	SEISMIC (psf)**
Active Pressure (wall is allowed to yield, i.e. move away from the soil, with a minimum 0.001H movement/rotation at the top of the wall, where “H” is the total height of the wall)	35	52
At-Rest Pressure (wall is not allowed to yield)	55	138
Passive Pressure (wall moves into the soil)	425	425

*Equivalent Fluid Pressure (applied at 1/3 Height of 4-foot High Wall)
**Uniform Pressure, Seismic Only (applied at 1/2 Height of 4-foot High Wall)

9.0 BOUYANT FORCES

Groundwater was not encountered in our explorations. Based upon this condition we anticipate that underground tanks will not need to be designed to resist buoyant forces.

10.0 FLOOR SLABS

Floor slabs may be supported on suitable, undisturbed natural sand soils, or on structural fill extending to natural soils (same as for foundations). Under no circumstances shall floor slabs be established directly on any topsoil, non-engineered fills, loose or disturbed soils, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water.

In order to facilitate curing of the concrete, we recommend that floor slabs placed on structural fill be directly underlain by at least 4 inches of "free-draining" fill, such as "pea" gravel or 3/4-inch quarters to 1-inch minus, clean, gap-graded gravel. To help control normal shrinkage and stress cracking, the floor slabs should have the following features:

1. Adequate reinforcement for the anticipated floor loads with the reinforcement continuous through interior floor joints;
2. Frequent crack control joints; and
3. Non-rigid attachment of the slabs to foundation walls and bearing slabs.

11.0 DRAINAGE RECOMMENDATIONS

It is important to the long-term performance of foundations and floor slabs that water not be allowed to collect near the foundation walls and infiltrate into the underlying soils. We recommend the following:

1. All areas around the structures should be sloped to provide drainage away from the foundations. We recommend a minimum slope of 4 inches in the first 10 feet away from the structure. This slope should be maintained throughout the lifetime of the structure.

2. All roof drainage should be collected in rain gutters with downspouts designed to discharge at least 10 feet from the foundation walls or well beyond the backfill limits, whichever is greater.

3. Adequate compaction of the foundation backfill should be provided. We suggest a minimum of 90% of the maximum laboratory density as determined by ASTM D-1557. Water consolidation methods should not be used under any circumstances.

4. Landscape sprinklers should be aimed away from the foundation walls. The sprinkling systems should be designed with proper drainage and be well-maintained. Over watering should be avoided.

5. Other precautions that may become evident during construction.

12.0 PAVEMENTS

All pavement areas must be prepared as discussed above in **Section 6.1**. Under no circumstances shall pavements be established over topsoil, non-engineered fill, loose or disturbed soils, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water.

We anticipate the near surface sand soils will exhibit fair pavement support characteristics when saturated or nearly saturated. Based on our laboratory testing experience with similar soils, our pavement design is based upon a Resistance (R) value of about 8 (approximate California Bearing Ratio of 40).

Given the projected traffic as discussed above in **Section 1.3**, the following pavement sections are recommended for the estimated Traffic Indices (TI):

MATERIAL	PAVEMENT SECTION THICKNESS (INCHES)					
	PARKING AREAS (T.I. = 5.0)			DRIVE/TRUCK AREAS (T.I. = 9.0)		
Asphalt	3	3	---	6	6	---
Concrete	---	--	5	---	---	7
Road-Base	10	6	6	9	6	8
Subbase	0	6	0	0	6	0
Total Thickness	13	15	11	15	18	15

Untreated base course (UTBC) should conform to city or Caltrans specifications. Material meeting our specification for structural fill can be used for subbase, as long as the fines content (percent passing No. 200 sieve) does not exceed 15%. Roadbase and subbase material should be compacted as recommended above in **Section 6.4**. Asphalt material generally should conform to Caltrans or APWA requirements.

Concrete pavement should be designed in accordance with the American Concrete Institute (ACI) and joint details should conform to the Portland Cement Association (PCA) guidelines. The concrete should have a minimum 28-day unconfined compressive strength of 4,000 pounds per square inch.

13.0 QUALITY CONTROL

We recommend that a comprehensive quality control testing and observation program be established during construction to help facilitate implementation of our recommendations and address, in a timely manner, any subsurface conditions encountered which vary from those described in this report. Without such a program CMT cannot be responsible for application of our recommendations to subsurface conditions which may vary from those described herein. This program may include, but not necessarily be limited to, the following:

13.1 Field Observations

Observations should be completed during all phases of construction such as site preparation, foundation excavation, structural fill placement and concrete placement.

13.2 Fill Compaction

Compaction testing is required for all structural supporting fill materials. Maximum Dry Density (Modified Proctor, ASTM D-1557) tests should be requested by the contractor immediately after delivery of any fill materials. The maximum density information should then be used for field density tests on each lift as necessary to ensure that the required compaction is being achieved.

13.3 Excavations

All excavation procedures and processes should be observed by a geotechnical engineer. In addition, for the recommendations in this report to be valid, all backfill and structural fill placed in trenches and all pavements should be density tested. We recommend that freshly mixed concrete be tested in accordance with ASTM designations.

14.0 LIMITATIONS

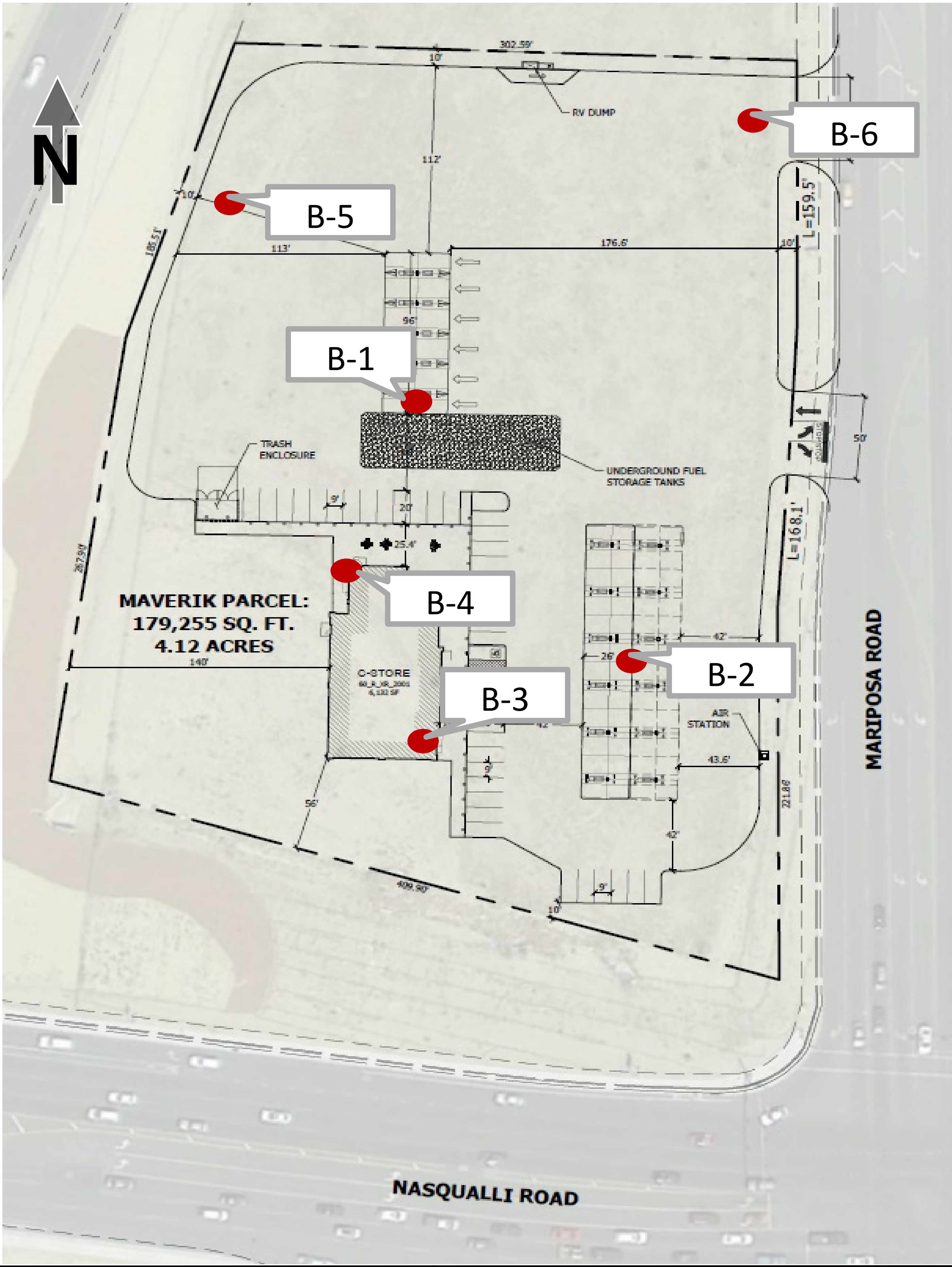
The recommendations provided herein were developed by evaluating the information obtained from the subsurface explorations and soils encountered therein. The exploration logs reflect the subsurface conditions only at the specific location at the particular time designated on the logs. Soil and ground water conditions may differ from conditions encountered at the actual exploration locations. The nature and extent of any variation in the explorations may not become evident until during the course of construction. If variations do appear, it may become necessary to re-evaluate the recommendations of this report after we have observed the variation.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

We appreciate the opportunity to be of service to you on this project. If we can be of further assistance or if you have any questions regarding this project, please do not hesitate to contact us at (801) 492-4132.

APPENDIX

SUPPORTING DOCUMENTATION



Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

CMT ENGINEERING LABORATORIES

Site Plan

Date:	9-Sep-20
Job #	15198

Figure: 1

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-1

Total Depth: 71.5'
Water Depth: (see Remarks)

Date: 8/22/20
Job #: 15198

Depth (ft)	Soil Description	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0	TOPSOIL: Sand, silt, roots, organics, slighty moist, brown											
	Silty SAND (SM), slightly moist, red-brown											
	medium dense	1	4 5 6	11								
4												
	dense	2	7 13 20	33								
	Clayey SAND (SC), slightly moist, brown; dense	3	12 21 28	49	9				41	30	19	11
8												
	very dense	4	37 50/5"	50+	5	121						
12												
16		5	17 24 28	52								
20	Poorly Graded SAND with silt (SP-SM), slightly moist, light gray-brown; dense	6	9 16 22	38	1		18	75	7			
24												
		7	13 17 21	38								
28												

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 2

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-1

Total Depth: 71.5'
Water Depth: (see Remarks)

Date: 8/22/20
Job #: 8/10/41

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
28	Poorly Graded SAND with silt (SP-SM), slightly moist, light gray-brown												
	dense		8	8 15 24	39								
32													
	Silty SAND (SM), slightly moist, light brown medium dense		9	8 12 17	29								
36													
40			10	8 15 17	32								
44			11	8 12 17	29								
48													
	dense		12	12 19 28	47	4				23			
52													
56			13	13 22	46								

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 2

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log — B-1

Total Depth: 71.5'
Water Depth: (see Remarks)

Date: 8/22/20
Job #: 8/10/41

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
56	Silty SAND (SM), slightly moist, light brown			24									
60	dense		14	10 19 25	44	3						NP	NP
64			15	11 18 24	42								
68	very dense		16	14 24 28	52								
72	END AT 71.5 FEET												
76													
80													
84													

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 2

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-2

Total Depth: 16.5'
Water Depth: (see Remarks)
Date: 8/22/20
Job #: 15198

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Blows Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0	TOPSOIL: Sand, silt, roots, organics, slighty moist, brown												
	Silty SAND (SM), slightly moist, red-brown												
	medium dense		17	6 12 15	27								
4													
	very dense		18	38 50/3"	50+	4	114			27			
8			19	15 30 36	66								
	medium dense		20	16 28									
12													
	Sandy CLAY (CL), moist, brown; blow counts not recorded; medium stiff?		21			6					27	19	8
16	END AT 16.5 FEET												
20													
24													
28													

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 3

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-3

Total Depth: 11.5'
Water Depth: (see Remarks)
Date: 8/22/20
Job #: 15198

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Blows Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0	TOPSOIL: Sand, silt, roots, organics, slightly moist, brown												
	Silty SAND (SM), slightly moist, red-brown												
	very dense		22	15 30 31	61	3				29			
4													
	dense		23	12 19 20	39								
	Sandy SILT (ML), slightly moist, light brown — hard												
8			24	13 32 43	75								
			25	9 12 20	32	5						NP	NP
	END AT 11.5 FEET												
12													
16													
20													
24													
28													

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 4

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-4

Total Depth: 11'
Water Depth: (see Remarks)
Date: 8/22/20
Job #: 15198

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0	TOPSOIL: Sand, silt, roots, organics, slightly moist, brown												
	Silty SAND (SM), slightly moist, red-brown												
	medium dense		26	3 5 8	13								
4	dense		27	11 20 25	45	4				20			
8	very dense		28	18 21 32	53								
	dense		29	16 21 24	45								
	END AT 11.0 FEET												
12													
16													
20													
24													
28													

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

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Figure: 5

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-5

Total Depth: 5'
Water Depth: (see Remarks)
Date: 8/22/20
Job #: 15198

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Blows Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0	TOPSOIL: Sand, silt, roots, organics, slightly moist, brown												
	Silty SAND (SM), slightly moist, red-brown; loose		30	4 4 4	8	1				23			
	medium dense		31	3 6 10	16								
4													
	END AT 5.0 FEET												
8													
12													
16													
20													
24													
28													

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 6

Maverik Store

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Bore Hole Log B-6

Total Depth: 5'
Water Depth: (see Remarks)
Date: 8/22/20
Job #: 15198

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)	Blows (N) Total	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL: Sand, silt, roots, organics, slightly moist, brown												
		Silty SAND (SM), slightly moist, red-brown												
		medium dense		32	6 10 11	21								
4		dense		33	9 14 18	32								
		END AT 5.0 FEET												
8														
12														
16														
20														
24														
28														

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Cascade
Logged By: J. Grippa

CMT ENGINEERING LABORATORIES

Figure: 7

Maverik Store

Key to Symbols

NWC of Mariposa Rd & Nasqualli Rd, Victorville, CA

Date: 8/22/20
Job #: 15198

① Depth (ft)	② GRAPHIC LOG	③ Soil Description	④ Sample Type	⑤ Sample #	Blows(N) ⑥	Blows(N) ⑦ Total	⑧ Moisture (%)	⑨ Dry Density(pcf)	Gradation ⑩ Gravel %	Gradation Sand %	Gradation Fines %	Atterberg ⑪ LL	Atterberg PL	Atterberg PI

COLUMN DESCRIPTIONS

① **Depth (ft.):** Depth (feet) below the ground surface (including groundwater depth - see water symbol below).

② **Graphic Log:** Graphic depicting type of soil encountered (see ② below).

③ **Soil Description:** Description of soils encountered, including Unified Soil Classification Symbol (see below).

④ **Sample Type:** Type of soil sample collected at depth interval shown; sampler symbols are explained below-right

⑤ **Sample #:** Consecutive numbering of soil samples collected during field exploration.

⑥ **Blows:** Number of blows to advance sampler in 6" increments, using a 140-lb hammer with 30" drop.

⑦ **Total Blows:** Number of blows to advance sampler the 2nd and 3rd 6" increments.

⑧ **Moisture (%):** Water content of soil sample measured in laboratory (percentage of dry weight of sample).

⑨ **Dry Density (pcf):** The dry density of a soil measured in laboratory (pounds per cubic foot).

⑩ **Gradation:** Percentages of Gravel, Sand and Fines (Silt/Clay), obtained from lab test results of soil passing the No. 4 and No. 200 sieves.

⑪ **Atterberg:** Individual descriptions of Atterberg Tests are as follows:

LL = Liquid Limit (%): Water content at which a soil changes from plastic to liquid behavior.

PL = Plastic Limit (%): Water content at which a soil changes from liquid to plastic behavior.

PI = Plasticity Index (%): Range of water content at which a soil exhibits plastic properties (= Liquid Limit - Plastic Limit).

STRATIFICATION	
Description	**Thickness**
Seam	Up to ½ inch
Lense	Up to 12 inches
Layer	Greater than 12 in.
Occasional	1 or less per foot
Frequent	More than 1 per foot

MODIFIERS
Trace
<5%
Some
5-12%
With
> 12%

MOISTURE CONTENT
Dry: Absence of moisture, dusty, dry to the touch.
Moist: Damp / moist to the touch, but no visible water.
Saturated: Visible water, usually soil below groundwater.

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS			USCS SYMBOLS	②	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS More than 50% of material is larger than No. 200 sieve size.	GRAVELS The coarse fraction retained on No. 4 sieve.	CLEAN GRAVELS (< 5% 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 (≥ 12% fines)	GM		Silty Gravels, Gravel-Sand-Silt Mixtures
			GC		Clayey Gravels, Gravel-Sand-Clay Mixtures
	SANDS The coarse fraction passing through No. 4 sieve.	CLEAN SANDS (< 5% fines)	SW		Well-Graded Sands, Gravelly Sands, Little or No Fines
			SP		Poorly-Graded Sands, Gravelly Sands, Little or No Fines
		SANDS WITH FINES (≥ 12% 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, Silty or Clayey Fine Sands or Clayey Silts with Slight
			CL		Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean
			OL		Organic Silts and Organic Silty Clays o f Low Plasticity
	SILTS AND CLAYS Liquid Limit greater than 50%		MH		Inorganic Silts, Micacious or Diatomacious Fine Sand or Silty Soils with Plasticity (Elastic Silts)
			CH		Inorganic Clays of High Plasticity, Fat Clays
			OH		Organic Silts and Organic Clays of Medium to High Plasticity
HIGHLY ORGANIC SOILS			PT		Peat, Humus, Swamp Soils with High Organic Contents

Note: Dual Symbols are used to indicate borderline soil classifications (i.e. GP-GM, SC-SM, etc.).

SAMPLER SYMBOLS

- Block Sample
- Bulk/Bag Sample
- Modified California Sampler 3.5" OD, 2.42" ID D&M Sampler
- Rock Core
- Standard Penetration Split Spoon Sampler
- Thin Wall (Shelby Tube)

WATER SYMBOL

- Encountered Water Level
- Measured Water Level

(see Remarks on Logs)

1. The results of laboratory tests on the samples collected are shown on the logs at the respective sample depths.
2. The subsurface conditions represented on the logs are for the locations specified. Caution should be exercised if interpolating between or extrapolating beyond the exploration locations.
3. The information presented on each log is subject to the limitations, conclusions, and recommendations presented in this report.

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Figure: 8

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for
San Bernardino County, California, Mojave River Area

November 25, 2020

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

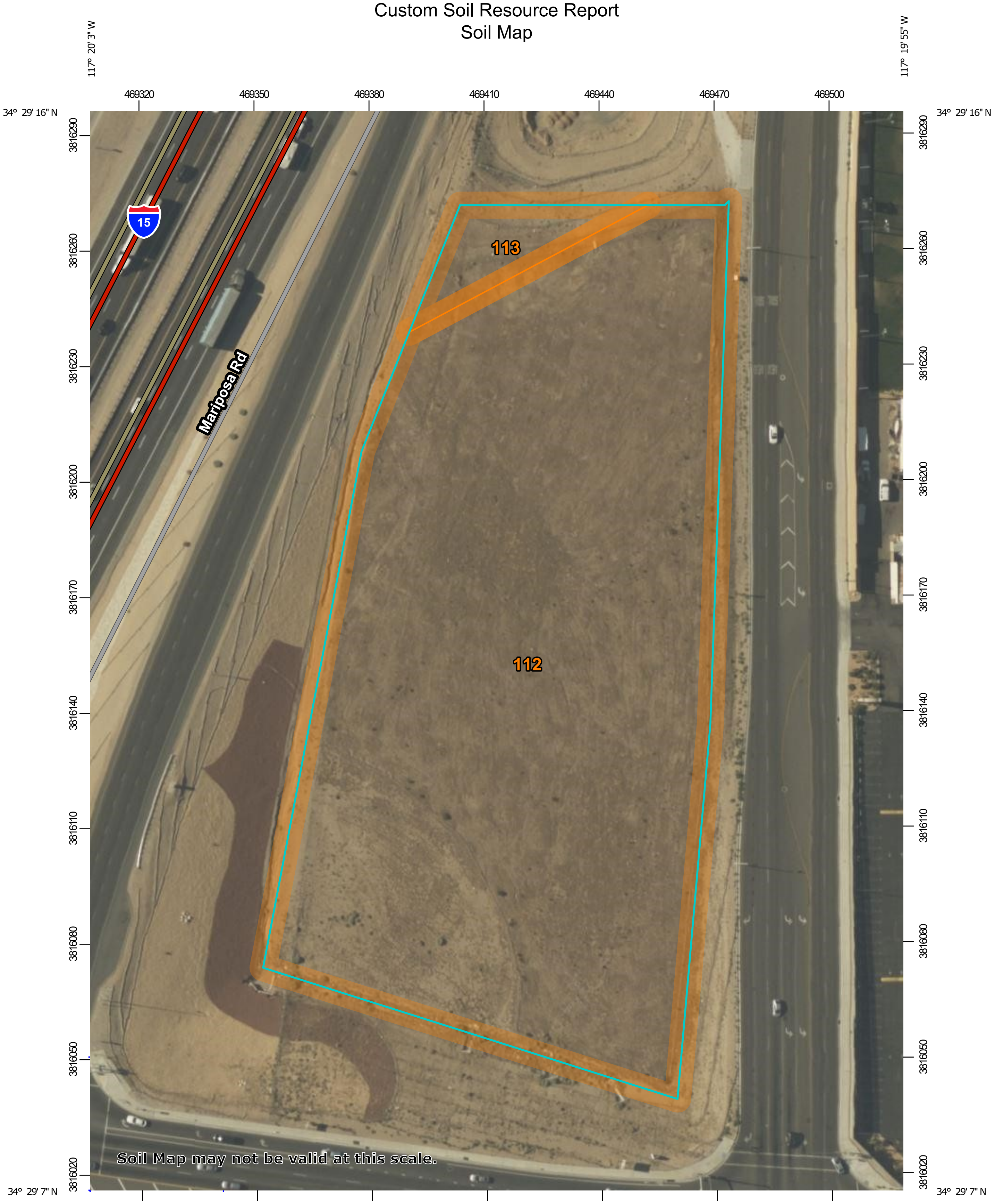
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:1,370 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 20, 40, 80, 120

Feet: 0, 50, 100, 200, 300

N

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, California, Mojave River Area
Survey Area Data: Version 12, May 27, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 26, 2019—Jul 8, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND	MAP INFORMATION
	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
112	CAJON SAND, 0 TO 2 PERCENT SLOPES	5.0	96.1%
113	CAJON SAND, 2 TO 9 PERCENT SLOPES	0.2	3.9%
Totals for Area of Interest		**5.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

San Bernardino County, California, Mojave River Area

112—CAJON SAND, 0 TO 2 PERCENT SLOPES

Map Unit Setting

National map unit symbol: hkrj
Elevation: 1,800 to 3,200 feet
Mean annual precipitation: 3 to 6 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 180 to 290 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cajon and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cajon

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite sources

Typical profile

H1 - 0 to 7 inches: sand
H2 - 7 to 25 inches: sand
H3 - 25 to 45 inches: gravelly sand
H4 - 45 to 60 inches: stratified sand to loamy fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R030XF012CA - Sandy
Hydric soil rating: No

Minor Components

Helendale

Percent of map unit: 5 percent

Manet

Percent of map unit: 5 percent
Landform: Playas
Hydric soil rating: Yes

Kimberlina

Percent of map unit: 5 percent

113—CAJON SAND, 2 TO 9 PERCENT SLOPES

Map Unit Setting

National map unit symbol: hkrk
Elevation: 1,800 to 3,500 feet
Mean annual precipitation: 3 to 6 inches
Mean annual air temperature: 59 to 68 degrees F
Frost-free period: 180 to 290 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cajon and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cajon

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed sources

Typical profile

A - 0 to 6 inches: sand
C1 - 6 to 25 inches: sand
C2 - 25 to 60 inches: gravelly sand, stratified gravelly sand to sand
C2 - 25 to 60 inches:

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent

Available water capacity: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R030XF012CA - Sandy
Hydric soil rating: No

Minor Components

Helendale

Percent of map unit: 5 percent
Landform: Alluvial fans
Hydric soil rating: No

Cajon, gravelly surface

Percent of map unit: 5 percent
Landform: Alluvial fans

Kimberlina

Percent of map unit: 5 percent
Landform: Alluvial fans
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Appendix I – Noise Assessment

Acoustical Assessment
Victorville Nisqualli Project
City of Victorville, California

Prepared by:

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LIST OF ABBREVIATED TERMS

APN	Assessor's Parcel Number
ADT	average daily traffic
dBA	A-weighted sound level
CEQA	California Environmental Quality Act
CLSP	California Landings Specific Plan
CSMA	California Subdivision Map Act
CNEL	community equivalent noise level
L_{dn}	day-night noise level
dB	decibel
du/ac	dwelling units per acre
L_{eq}	equivalent noise level
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HVAC	heating ventilation and air conditioning
Hz	hertz
HOA	homeowner's association
in/sec	inches per second
L_{max}	maximum noise level
µPa	micropascals
L_{min}	minimum noise level
PPV	peak particle velocity
RMS	root mean square
VdB	vibration velocity level

1 INTRODUCTION

This report documents the results of an Acoustical Assessment completed for the Victorville Nisqualli project (Project). The purpose of this Acoustical Assessment is to evaluate the potential construction and operational noise and vibration levels associated with the Project and determine the level of impact the Project would have on the environment.

1.1 Project Location

The proposed Project site is located at the northwest corner of Nisqualli Road and Mariposa Road in the City of Victorville, County of San Bernardino, California. The assessor's parcel numbers (APNs) for the Project site are 3092-311-09 and -10. The Project site is located east of Interstate 15 (I-15), north of Nisqualli Road, and west of Mariposa Road. The Project site is bounded by vacant land to the north, Victorville School District to the south, Victor Valley Christian School & First Assembly of God Church to the east, and I-15 to the west; refer to **Exhibit 1: Regional Location Map** and **Exhibit 2: Project Vicinity Map.**

1.2 Project Description

The Project site is an undeveloped, fully pervious, and vegetated with annual grasses and weeds. The site is 6.03-acres or 262,231 square feet (SF) composed of two APNs. The proposed Project is a standalone development consisting of a new Maverik 9,084-square-foot building containing a convenience/quick service restaurant (QSR) and a QSR with drive thru. The convenience store/QSR without drive thru would be located on western portion of the proposed building. The QSR with drive thru would be located on the eastern portion of the proposed building. The drive thru ingress would begin between the western property line and the west side of the proposed building. The drive thru lane would wrap around the back of the building with an approximate capacity of fourteen vehicles in the queue. The drive thru egress would terminate at the point of sale (POS) located along the eastern portion of the proposed building.

Additionally, the Project would include a fuel station for passenger cars and trucks with accompanying fuel islands and canopies, underground fuel storage tanks, associated fueling appurtenances, recreational vehicle (RV) dump, air compressor, a truck scale, landscaping, concrete, hardscape, and asphalt paving. The associated improvements include, but are not limited to onsite and offsite grading, domestic water service, sanitary sewer service, storm drain infrastructure, street improvements, concrete and asphalt pavement, landscaping, and irrigation. The truck scale would be installed along the northwest property line and the RV dump along the eastern property line, just north of the main entrance; refer to **Exhibit 3: Site Plan.**

The fuel island canopies would be supported by steel frames and columns extending to the foundation system. Twelve fueling islands would be provided. The parking/drive paved areas would utilize both asphalt and concrete pavement. Concrete pavement would be installed in front of the proposed store structure, as well as in the canopy fuel islands and over the underground storage tank area. In other areas, asphalt concrete sections would be used. Traffic is projected to consist mostly of automobiles and light trucks.

Daily routine site activities would consist of customers entering the site to fuel their automobiles or trucks and entering the convenience store for food/snacks or utilizing the proposed drive thru. A covered trash enclosure would be provided along the western property line at the level of the main entrance.

The Project site is designated under the General Plan Land Use Map as (COM) Commercial with a zoning district of (C-2T) General Commercial.

Site Access and Parking

Main ingress and egress to the site is provided via one full-movement driveway (North Driveway) on the eastern property line along Mariposa Road, approximately 350 feet north of Nisqualli Road. A second driveway (South Driveway) is provided on the northeast corner of the site. Pedestrian and ADA access to the Project site is provided on Mariposa Road via a pedestrian designated path of travel traversing the site horizontally and another path of travel on the southwest corner of the site; refer to **Exhibit 3**.

The Project is required to provide a minimum of 32 parking spaces. The Project would provide 42 standard parking spaces inclusive of 2 ADA parking spaces. As shown on **Exhibit 3**, passenger vehicle parking is provided along south west, south, and southeast portions of the site, adjacent to the convenience store and QSR.

Construction

The proposed Project is anticipated to be constructed in one phase. Construction is anticipated to begin in January 2022 with completion of January 2023. The soil cut is anticipated at 15,730 CY, with approximately 1,383 CY of fill and a net of 14,347 CY.

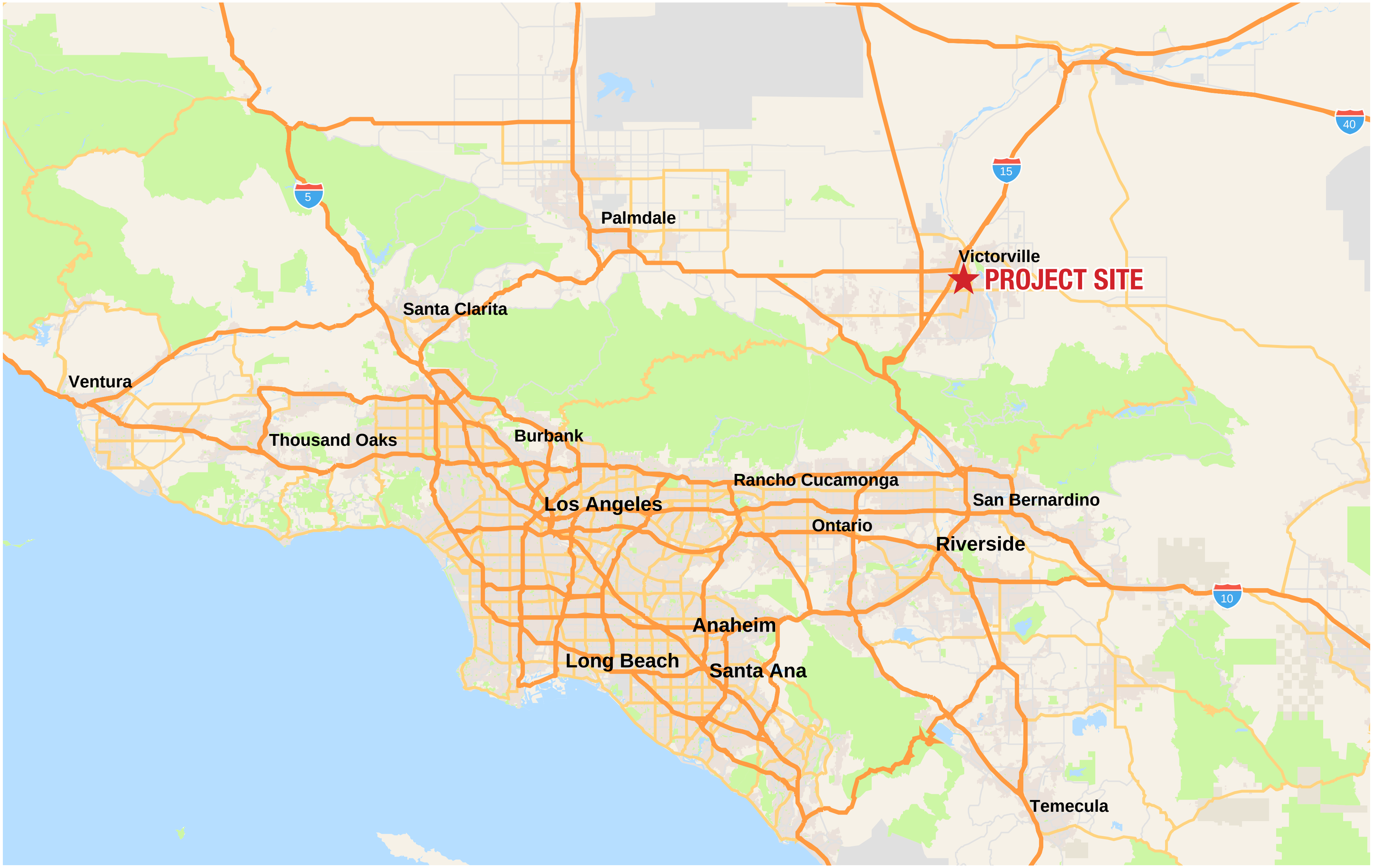

EXHIBIT 1: Regional Location Map
Victorville Nisqualli Gas Station Project
City of Victorville

N Not to Scale

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EXHIBIT 2: Project Vicinity Map
Victorville Nisqualli Gas Station Project
City of Victorville

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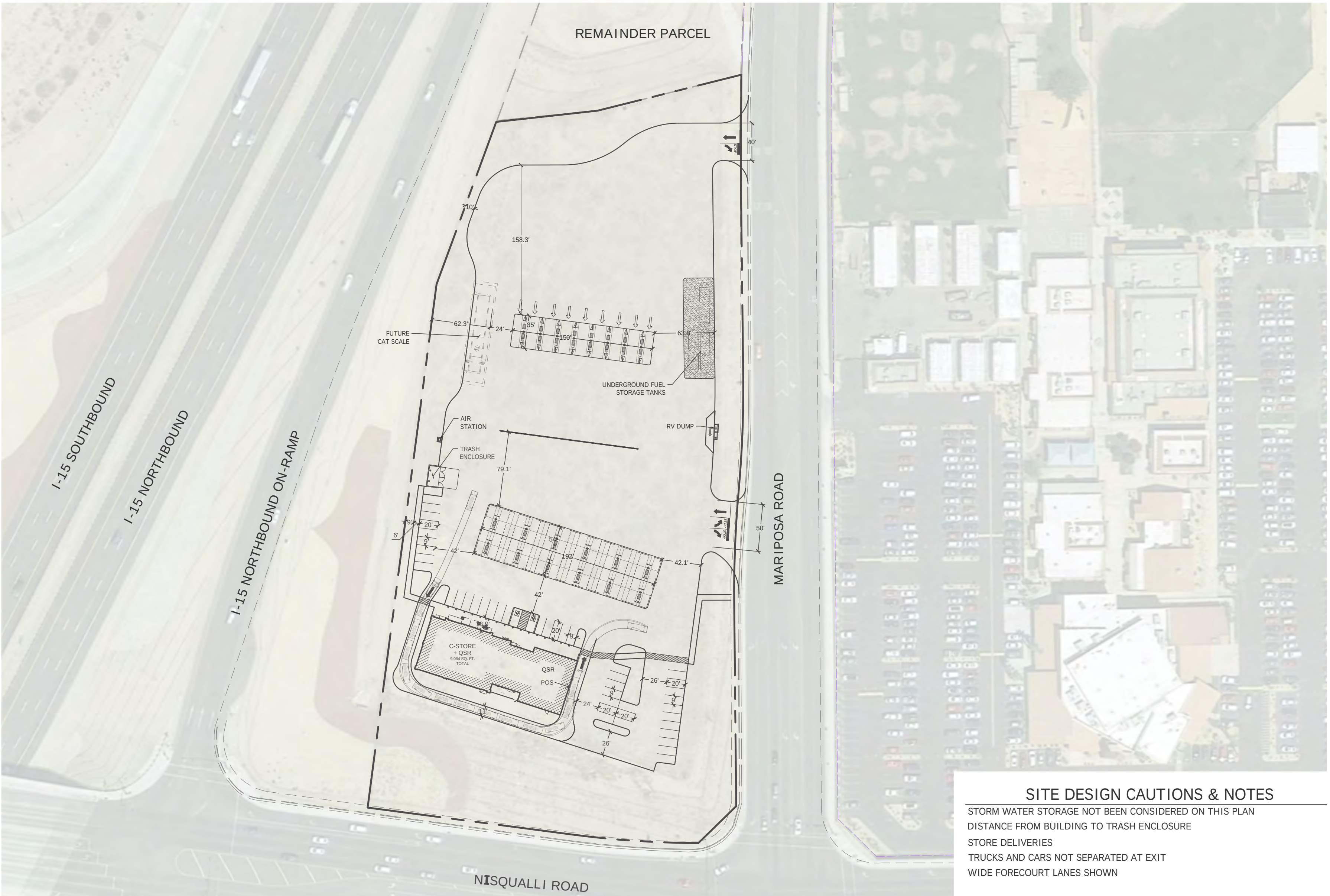

SITE DESIGN CAUTIONS & NOTES

STORM WATER STORAGE NOT BEEN CONSIDERED ON THIS PLAN
DISTANCE FROM BUILDING TO TRASH ENCLOSURE
STORE DELIVERIES
TRUCKS AND CARS NOT SEPARATED AT EXIT
WIDE FORECOURT LANES SHOWN

EXHIBIT 3: Conceptual Site Plan
Victorville Nisqualli Gas Station Project
City of Victorville

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2 ACOUSTIC FUNDAMENTALS

2.1 Sound and Environmental Noise

Acoustics is the science of sound. Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a medium (e.g. air) to human (or animal) ear. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard and are called sound. The number of pressure variations per second is called the frequency of sound and is expressed as cycles per second, or hertz (Hz).

Noise is defined as loud, unexpected, or annoying sound. In acoustics, the fundamental model consists of a noise source, a receptor, and the propagation path between the two. The loudness of the noise source, obstructions, or atmospheric factors affecting the propagation path, determine the perceived sound level and noise characteristics at the receptor. Acoustics deal primarily with the propagation and control of sound. A typical noise environment consists of a base of steady background noise that is the sum of many distant and indistinguishable noise sources. Superimposed on this background noise is the sound from individual local sources. These sources can vary from an occasional aircraft or train passing by to continuous noise from traffic on a major highway. Perceptions of sound and noise are highly subjective from person to person.

Measuring sound directly in terms of pressure would require a large range of numbers. To avoid this, the decibel (dB) scale was devised. The dB scale uses the hearing threshold of 20 micropascals (µPa) as a point of reference, defined as 0 dB. Other sound pressures are then compared to this reference pressure, and the logarithm is taken to keep the numbers in a practical range. The dB scale allows a million-fold increase in pressure to be expressed as 120 dB, and changes in levels correspond closely to human perception of relative loudness. **Table 1: Typical Noise Levels** provides typical noise levels.

Table 1: Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	– 110 –	Rock Band
Jet fly-over at 1,000 feet		
	– 100 –	
Gas lawnmower at 3 feet		
	– 90 –	
Diesel truck at 50 feet at 50 miles per hour		Food blender at 3 feet
	– 80 –	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawnmower, 100 feet	**– 70 –**	Vacuum cleaner at 10 feet
Commercial area		Normal Speech at 3 feet
Heavy traffic at 300 feet	**– 60 –**	
		Large business office
Quiet urban daytime	**– 50 –**	Dishwasher in next room
Quiet urban nighttime	**– 40 –**	Theater, large conference room (background)
Quiet suburban nighttime		
	– 30 –	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	– 20 –	
		Broadcast/recording studio
	– 10 –	
Lowest threshold of human hearing	**– 0 –**	Lowest threshold of human hearing

Source: California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013.

Noise Descriptors

The dB scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Several rating scales have been developed to analyze the adverse effect of community noise on people. Because environmental noise fluctuates over time, these scales consider that the effect of noise on people is largely dependent on the total acoustical energy content of the noise, as well as the time of day when the noise occurs. The equivalent noise level (L_{eq}) is the average noise level averaged over the measurement period, while the day-night noise level (L_{dn}) and Community Equivalent Noise Level (CNEL) are measures of energy average during a 24-hour period, with dB weighted sound levels from 7:00 p.m. to 7:00 a.m. Most commonly, environmental sounds are described in terms of L_{eq} that has the same acoustical energy as the summation of all the time-varying events. Each is applicable to this analysis and defined in **Table 2: Definitions of Acoustical Terms.**

Table 2: Definitions of Acoustical Terms

Term	Definitions
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in μPa (or 20 micronewtons per square meter), where 1 pascals is the pressure resulting from a force of 1 newton exerted over an area of 1 square meter. The sound pressure level is expressed in dB as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g. 20 μPa). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency (Hz)	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level (dBA)	The sound pressure level in dB as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level (L_{eq})	The average acoustic energy content of noise for a stated period of time. Thus, the L_{eq} of a time-varying noise and that of a steady noise are the same if they deliver the same acoustic energy to the ear during exposure. For evaluating community impacts, this rating scale does not vary, regardless of whether the noise occurs during the day or the night.
Maximum Noise Level (L_{max}) Minimum Noise Level (L_{min})	The maximum and minimum dBA during the measurement period.
Exceeded Noise Levels (L_{01}, L_{10}, L_{50}, L_{90})	The dBA values that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day-Night Noise Level (L_{dn})	A 24-hour average L_{eq} with a 10 dBA weighting added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity at nighttime. The logarithmic effect of these additions is that a 60 dBA 24-hour L_{eq} would result in a measurement of 66.4 dBA L_{dn}.
Community Noise Equivalent Level (CNEL)	A 24-hour average L_{eq} with a 5 dBA weighting during the hours of 7:00 a.m. to 10:00 p.m. and a 10 dBA weighting added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity in the evening and nighttime, respectively. The logarithmic effect of these additions is that a 60 dBA 24-hour L_{eq} would result in a measurement of 66.7 dBA CNEL.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends on its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

The A-weighted decibel (dBA) sound level scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends on the distance between the receptor and the noise source.

A-Weighted Decibels

The perceived loudness of sounds is dependent on many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable and can be approximated by dBA values. There is a strong correlation between dBA and the way the human ear perceives sound. For this reason, the dBA has become the standard tool of environmental noise assessment. All noise levels reported in this document are in terms of dBA, but are expressed as dB, unless otherwise noted.

Addition of Decibels

The dB scale is logarithmic, not linear, and therefore sound levels cannot be added or subtracted through ordinary arithmetic. Two sound levels 10 dB apart differ in acoustic energy by a factor of 10. When the standard logarithmic dB is A-weighted, an increase of 10 dBA is generally perceived as a doubling in loudness. For example, a 70-dBA sound is half as loud as an 80-dBA sound and twice as loud as a 60-dBA sound. When two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dBA higher than one source under the same conditions. Under the dB scale, three sources of equal loudness together would produce an increase of 5 dBA.

Sound Propagation and Attenuation

Sound spreads (propagates) uniformly outward in a spherical pattern, and the sound level decreases (attenuates) at a rate of approximately 6 dB for each doubling of distance from a stationary or point source. Sound from a line source, such as a highway, propagates outward in a cylindrical pattern. Sound levels attenuate at a rate of approximately 3 dB for each doubling of distance from a line source, such as a roadway, depending on ground surface characteristics. No excess attenuation is assumed for hard surfaces like a parking lot or a body of water. Soft surfaces, such as soft dirt or grass, can absorb sound, so an excess ground-attenuation value of 1.5 dB per doubling of distance is normally assumed. For line sources, an overall attenuation rate of 3 dB per doubling of distance is assumed.

Noise levels may also be reduced by intervening structures; generally, a single row of buildings between the receptor and the noise source reduces the noise level by about 5 dBA, while a solid wall or berm reduces noise levels by 5 to 10 dBA. The way older homes in California were constructed generally provides a reduction of exterior-to-interior noise levels of about 20 to 25 dBA with closed windows. The exterior-to-interior reduction of newer residential units is generally 30 dBA or more.

Human Response to Noise

The human response to environmental noise is subjective and varies considerably from individual to individual. Noise in the community has often been cited as a health problem, not in terms of actual physiological damage, such as hearing impairment, but in terms of inhibiting general well-being and contributing to undue stress and annoyance. The health effects of noise in the community arise from interference with human activities, including sleep, speech, recreation, and tasks that demand concentration or coordination. Hearing loss can occur at the highest noise intensity levels.

Noise environments and consequences of human activities are usually well represented by median noise levels during the day or night or over a 24-hour period. Environmental noise levels are generally considered low when the CNEL is below 60 dBA, moderate in the 60 to 70 dBA range, and high above 70 dBA. Examples of low daytime levels are isolated, natural settings with noise levels as low as 20 dBA and quiet, suburban, residential streets with noise levels around 40 dBA. Noise levels above 45 dBA at night can disrupt sleep. Examples of moderate-level noise environments are urban residential or semi-commercial areas (typically 55 to 60 dBA) and commercial locations (typically 60 dBA). People may consider louder environments adverse, but most will accept the higher levels associated with noisier urban residential or residential-commercial areas (60 to 75 dBA) or dense urban or industrial areas (65 to 80 dBA). Regarding increases in dBA, the following relationships should be noted:

- Except in carefully controlled laboratory experiments, a 1-dBA change cannot be perceived by humans.
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference.
- A minimum 5-dBA change is required before any noticeable change in community response would be expected. A 5-dBA increase is typically considered substantial.
- A 10-dBA change is subjectively heard as an approximate doubling in loudness and would almost certainly cause an adverse change in community response.

Effects of Noise on People

Hearing Loss

While physical damage to the ear from an intense noise impulse is rare, a degradation of auditory acuity can occur even within a community noise environment. Hearing loss occurs mainly due to chronic exposure to excessive noise but may be due to a single event such as an explosion. Natural hearing loss associated with aging may also be accelerated from chronic exposure to loud noise. The Occupational Safety and Health Administration has a noise exposure standard that is set at the noise threshold where hearing loss may occur from long-term exposures. The maximum allowable level is 90 dBA averaged over 8 hours. If the noise is above 90 dBA, the allowable exposure time is correspondingly shorter.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn} as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. A noise level of about 55 dBA L_{dn} is the threshold at which a substantial percentage of people begin to report annoyance[1].

2.2 Ground-borne Vibration

Sources of ground-borne vibrations include natural phenomena (earthquakes, volcanic eruptions, sea waves, landslides, etc.) or man-made causes (explosions, machinery, traffic, trains, construction equipment, etc.). Vibration sources may be continuous (e.g. factory machinery) or transient (e.g. explosions). Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One is the peak particle velocity (PPV); another is the root mean square (RMS) velocity. The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. The RMS velocity is defined as the average of the squared amplitude of the signal. The PPV and RMS vibration velocity amplitudes are used to evaluate human response to vibration.

Table 3: Human Reaction and Damage to Buildings for Continuous or Frequent Intermittent Vibrations, displays the reactions of people and the effects on buildings produced by continuous vibration levels. The annoyance levels shown in the table should be interpreted with care since vibration may be found to be annoying at much lower levels than those listed, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage. In high noise environments, which are more prevalent where ground-borne vibration approaches perceptible levels, this rattling phenomenon may also be produced by loud airborne environmental noise causing induced vibration in exterior doors and windows.

Table 3: Human Reaction and Damage to Buildings for Continuous or Frequent Intermittent Vibrations

Maximum PPV (in/sec)	Vibration Annoyance Potential Criteria	Vibration Damage Potential Threshold Criteria	FTA Vibration Damage Criteria
0.008	--	Extremely fragile historic buildings, ruins, ancient monuments	--
0.01	Barely Perceptible	--	--
0.04	Distinctly Perceptible	--	--
0.1	Strongly Perceptible	Fragile buildings	--
0.12	--	--	Buildings extremely susceptible to vibration damage
0.2	--	--	Non-engineered timber and masonry buildings
0.25	--	Historic and some old buildings	--
0.3	--	Older residential structures	Engineered concrete and masonry (no plaster)
0.4	Severe	--	--
0.5	--	New residential structures, Modern industrial/commercial buildings	Reinforced-concrete, steel or timber (no plaster)

PPV = peak particle velocity; in/sec = inches per second; FTA = Federal Transit Administration

Source: California Department of Transportation, *Transportation and Construction Vibration Guidance Manual*, 2020 and Federal Transit administration, *Transit Noise and Vibration Assessment Manual*, 2018.

[1] Federal Interagency Committee on Noise, *Federal Agency Review of Selected Airport Noise Analysis Issues*, August 1992.

Ground vibration can be a concern in instances where buildings shake, and substantial rumblings occur. However, it is unusual for vibration from typical urban sources such as buses and heavy trucks to be perceptible. Common sources for ground-borne vibration are planes, trains, and construction activities such as earth-moving which requires the use of heavy-duty earth moving equipment. For the purposes of this analysis, a PPV descriptor with units of inches per second (in/sec) is used to evaluate construction-generated vibration for building damage and human complaints.

3 REGULATORY SETTING

To limit population exposure to physically or psychologically damaging as well as intrusive noise levels, the Federal government, the State of California, various county governments, and most municipalities in the state have established standards and ordinances to control noise.

3.1 State of California

California Government Code

California Government Code Section 65302(f) mandates that the legislative body of each county and city adopt a noise element as part of its comprehensive general plan. The local noise element must recognize the land use compatibility guidelines established by the State Department of Health Services. The guidelines rank noise land use compatibility in terms of “normally acceptable”, “conditionally acceptable”, “normally unacceptable”, and “clearly unacceptable” noise levels for various land use types. Single-family homes are “normally acceptable” in exterior noise environments up to 60 CNEL and “conditionally acceptable” up to 70 CNEL. Multiple-family residential uses are “normally acceptable” up to 65 CNEL and “conditionally acceptable” up to 70 CNEL. Schools, libraries, and churches are “normally acceptable” up to 70 CNEL, as are office buildings and business, commercial, and professional uses.

Title 24 – Building Code

The State’s noise insulation standards are codified in the California Code of Regulations, Title 24: Part 1, Building Standards Administrative Code, and Part 2, California Building Code. These noise standards are applied to new construction in California for interior noise compatibility from exterior noise sources. The regulations specify that acoustical studies must be prepared when noise-sensitive structures, such as residential buildings, schools, or hospitals, are located near major transportation noise sources, and where such noise sources create an exterior noise level of 65 dBA CNEL or higher. Acoustical studies that accompany building plans must demonstrate that the structure has been designed to limit interior noise in habitable rooms to acceptable noise levels. For new multi-family residential and non-residential buildings, the acceptable interior noise limit for new construction is 45 dBA CNEL.

3.2 Local

City of Victorville General Plan

The City of Victorville General Plan Noise Element identifies several policies to minimize the impacts of excessive noise levels throughout the community. The Noise Element provides policy guidance which addresses the generation, mitigation, avoidance, and the control of excessive noise. The noise policies specified in the Noise Element provide the guidelines necessary to satisfy these goals. To ensure that the Victorville community is not exposed to excessive noise levels, the noise Element policies provide exterior standards of 65 dBA as “normally acceptable” and 70 dBA as “conditionally acceptable” for retail and commercial land uses. **Applicable** goals and policies **are provided below.**

Goal #2: **Noise Control: manage the effects of noise emissions to help ensure reduction of adverse effects on the community.**

Objective 2.1: Ensure existing and future noise sources are properly attenuated.

Policy 2.1.1: Continue to implement acceptable standards for noise for various land uses throughout the City.

Implementation Measure 2.1.1.1: Require a noise study to be performed and appropriate noise attenuation to be incorporated prior to approving any multifamily or mixed-use residential development in an area with a CNEL of 65 dB or greater.

Implementation Measure 2.1.1.2: Monitor noise complaints and enforce provisions of the City noise ordinance.

Implementation Measure 2.1.1.3: Discourage location of new educational facilities in areas with noise levels greater than 65 dB CNEL.

Implementation Measure 2.1.1.5: Continue to restrict noise and require mitigation measures for any noise-emitting construction equipment or activity.

Implementation Measure 2.1.1.6: Reduce speed limits on arterial streets if necessary, to lower sound to appropriate levels for adjacent and surrounding land uses.

City of Victorville Municipal Code

The City of Victorville Municipal Code Noise Control Ordinance (Chapter 13.01) includes regulations and thresholds to control the negative effects of nuisance noise. Sections 13.01.040 and 13.01.050 of the Municipal Code sate that the noise levels in all commercial zones shall not exceed 70 dB(A) with the following dB(A) levels for the cumulative period of time specified:

(1) Less than 5dB(A) for a cumulative period of more than thirty minutes in any hour;
(2) Less than 10 dB(A) for a cumulative period of more than fifteen minutes in any hour;
(3) Less than 15 dB(A) for a cumulative period of more than five minutes in any hour;
(4) Less than 20 dB(A) for a cumulative period of more than one minute in any hour;

Section 13.01.060 of the code indicates the noise source exemptions and states: "The following activities shall be exempted from the provisions of this chapter:

(1) All mechanical devices, apparatus or equipment used, related to or connected with emergency machinery, vehicle or work.
(2) The provisions of this regulation shall not preclude the construction, operation, maintenance and repairs of equipment, apparatus or facilities of park and recreation projects, public works projects or essential public works services and facilities, including those utilities subject to the regulatory jurisdiction of the California Public Utilities Commission.

(3) Activities conducted on the grounds of any elementary, intermediate or secondary school or college.
(4) Outdoor gatherings, public dances and shows, provided said events are conducted pursuant to a permit as required by this code.
(5) Activities conducted in public parks and public playgrounds, provided said events are conducted pursuant to a permit as required by this code.
(6) Any activity to the extent regulation thereof has been preempted by state or federal law.
(7) Traffic on any roadway or railroad right-of-way.
(8) The operation of the Southern California Logistics Airport.
(9) Construction activity on private properties that are determined by the director of building and safety to be essential to the completion of a project."

The City excludes the construction activities from the noise provisions and also does not establish any limits to the hours during which construction activity can take place.

4 EXISTING CONDITIONS

4.1 Existing Noise Sources

The City of Victorville is impacted by various noise sources. Mobile sources of noise, especially cars and trucks, are the most common and significant sources of noise in most communities. Other noise sources are the various land uses (i.e., residential, commercial, industrial, and recreational and parks activities) throughout the City that generate stationary-source noise.

Mobile Sources

The predominant mobile noise source in the Project area is the traffic noise along Interstate-15 to the west, Nisqualli Road to the south, and Mariposa Road to the east. Amargosa Road is approximately 700 feet to the northwest of the Project site.

Stationary Sources

The primary sources of stationary noise in the Project vicinity are those associated with the I-15 Freeway to the left and the Victor Valley Christian School to the right. The Project site and surrounding areas are dominated by constant freeway noise.

4.2 Sensitive Receptors

Noise exposure goals for various types of land uses reflect the varying noise sensitivities associated with those uses. Noise sensitive uses typically include residences, hospitals, schools, childcare facilities, and places of assembly. Vibration sensitive receivers are generally similar to noise sensitive receivers but may also include businesses, such as research facilities and laboratories that use vibration-sensitive equipment. Sensitive land uses surrounding the Project consist of Victorville Elementary School and Victor Valley Christian School. Sensitive land uses nearest to the Project are shown in **Table 4: Sensitive Receptors**.

Table 4: Sensitive Receptors

Receptor Description	Distance and Direction from the Project
Victor Valley Christian School and First Assembly of God Church	325 feet to the east
Victorville Elementary School	400 feet to the south
Single-Family Residences	750 feet to the northwest
Single-Family Residences	840 feet to the southeast

Source: Google Earth

4.3 Noise Measurements

To quantify existing ambient noise levels in the Project area, Kimley-Horn conducted four short-term noise measurements on September 1, 2021; see **Appendix A: Noise Data**. The noise measurement sites were representative of typical existing noise exposure within and immediately adjacent to the Project site. The 10-minute measurements were taken between 9:30 a.m. and 10:15 a.m. near potential sensitive receptors. Short-term L_{eq} measurements are considered representative of the noise levels throughout the day. The noise levels measured at each location are listed in **Table 5: Existing Noise Measurements** and the measurement locations are depicted in **Exhibit 4: Noise Measurement Locations**.

Table 5: Existing Noise Measurements

Site	Location	L_{eq} (dBA)	L_{min} (dBA)	L_{max} (dBA)	Time
1	On the east side of the Project site, along Mariposa Road	66.7	56.7	77.1	09:36 a.m.
2	On the south section of the Project site, along Nisqualli Road, close to I-15 ramp	75.7	58.8	93.0	09:50 a.m.
3	Along Nisqualli Road, approximately 900 feet to the southeast	68.7	57.5	76.3	10:06 a.m.

Source: Noise measurements taken by Kimley-Horn, September 1, 2021. See Appendix A for noise measurement results.

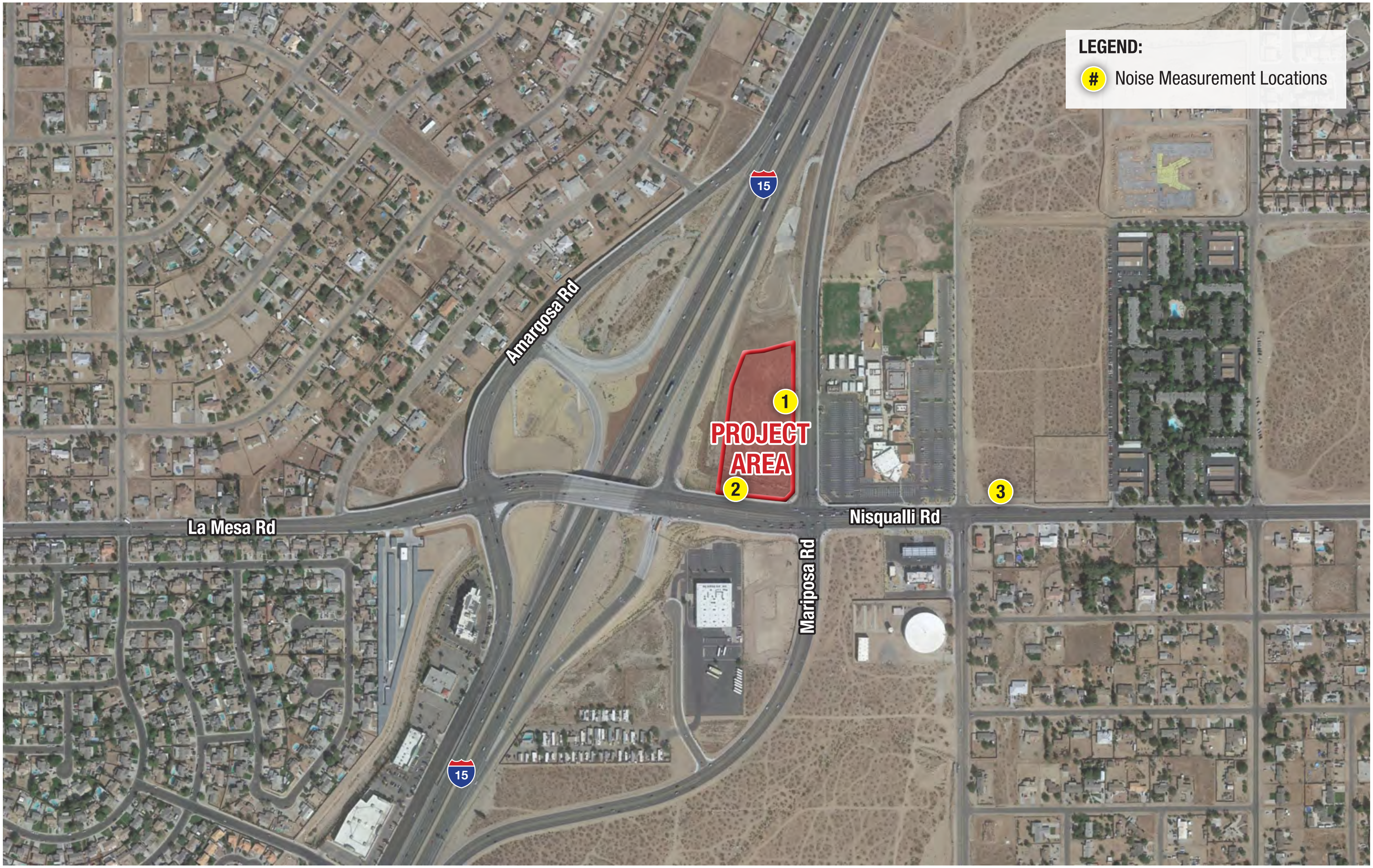

EXHIBIT 4: Noise Measurement Locations
Victorville Nisqualli Gas Station Project
City of Victorville

N Not to Scale

Kimley»Horn
Expect More. Experience Better.

5 SIGNIFICANCE CRITERIA AND METHODOLOGY

5.1 CEQA Thresholds

Appendix G of the California Environmental Quality Act (CEQA) Guidelines contains analysis guidelines related to noise impacts. These guidelines have been used by the City to develop thresholds of significance for this analysis. A project would create a significant environmental impact if it would:

- Generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

- Generate excessive ground-borne vibration or ground-borne noise levels; and

- 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, expose people residing or working in the Project area to excessive noise levels.

5.2 Methodology

Construction

Construction noise levels were based on typical noise levels generated by construction equipment published by the Federal Transit Administration (FTA) and FHWA. Construction noise is assessed in dBA L_{eq}. This unit is appropriate because L_{eq} can be used to describe noise level from operation of each piece of equipment separately, and levels can be combined to represent the noise level from all equipment operating during a given period.

Reference noise levels are used to estimate operational noise levels at nearby sensitive receptors based on a standard noise attenuation rate of 6 dB per doubling of distance (line-of-sight method of sound attenuation for point sources of noise). Noise level estimates do not account for the presence of intervening structures or topography, which may reduce noise levels at receptor locations. Therefore, the noise levels presented herein represent a conservative, reasonable worst-case estimate of actual temporary construction noise.

Operations

The analysis of the operational noise environment is based on noise attenuation calculations (inverse square law) and empirical observations. Reference noise level data are used to estimate the Project operational noise impacts from stationary sources. Noise levels were collected from published sources from similar types of activities and used to estimate noise levels expected with the Project's stationary sources. The reference noise levels are used to represent a worst-case noise environment as noise level from stationary sources can vary throughout the day. Operational noise is evaluated based on the standards within the City's noise standards.

Vibration

Ground-borne vibration levels associated with construction activities for the Project were evaluated utilizing typical ground-borne vibration levels associated with construction equipment, obtained from FTA published data for construction equipment. Potential ground-borne vibration impacts related to building/structure damage and interference with sensitive existing operations were evaluated, considering the distance from construction activities to nearby land uses and typically applied criteria.

6 POTENTIAL IMPACTS AND MITIGATION

6.1 Acoustical Impacts

Threshold 6.1 Would the Project generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Construction

Construction noise typically occurs intermittently and varies depending on the nature or phase of construction (e.g. land clearing, grading, excavation, paving). Noise generated by construction equipment, including earth movers, material handlers, and portable generators, can reach high levels. However, construction noise levels are not anticipated to affect sensitive receptors due to the Project's location. The Project site is located in a commercial (east, south, and southwest) and residential area (east and west). The sensitive land uses nearest to the Project site consist of schools located east and south of the Project site.

Construction activities would include site preparation, grading, building construction, paving, and architectural coating. Such activities would require graders, scrapers, and tractors during site preparation; graders, dozers, and tractors during grading; cranes, forklifts, generators, tractors, and welders during building construction; pavers, rollers, mixers, tractors, and paving equipment during paving; and air compressors during architectural coating. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full power operation followed by 3 to 4 minutes at lower power settings. Other primary sources of acoustical disturbance would be random incidents, which would last less than one minute (such as dropping large pieces of equipment or the hydraulic movement of machinery lifts). Noise generated by construction equipment, including earth movers, material handlers, and portable generators, can reach high levels. Typical noise levels associated with individual construction equipment are listed in **Table 6: Typical Construction Noise Levels**.

Table 6: Typical Construction Noise Levels

Equipment	Typical Noise Level (dBA) at 50 feet from Source	Typical Noise Level (dBA) at 325 feet from Source[1]
Air Compressor	80	63.7
Backhoe	80	63.7
Compactor	82	65.7
Concrete Mixer	85	68.7
Concrete Pump	82	65.7
Concrete Vibrator	76	59.7
Crane, Derrick	88	71.7
Crane, Mobile	83	66.7
Dozer	85	68.7
Generator	82	65.7
Grader	85	68.7
Impact Wrench	85	68.7
Jack Hammer	88	71.7
Loader	80	63.7
Paver	85	68.7
Pile-driver (Impact)	101	84.7
Pile-driver (Sonic)	95	78.7

Table 6: Typical Construction Noise Levels		
Equipment	**Typical Noise Level (dBA) at 50 feet from Source**	**Typical Noise Level (dBA) at 325 feet from Source[1]**
Pneumatic Tool	85	68.7
Pump	77	60.7
Roller	85	68.7
Saw	76	59.7
Scraper	85	68.7
Shovel	82	65.7
Truck	84	67.7

[1] Calculated using the inverse square law formula for sound attenuation: $dBA_2 = dBA_1+20Log(d_1/d_2)$
dBA_2 = estimated noise level at receptor; dBA_1 = reference noise level; d_1 = reference distance; d_2 = receptor location distance
Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, September 2018.

The noise levels calculated in **Table 7: Project Construction Noise Levels**, show estimated exterior construction noise without accounting for attenuation from existing physical barriers. The nearest noise sensitive receptors come from the Victor Valley Christian School 325 feet to the east of the Project site. All construction equipment was assumed to operate simultaneously at a construction area nearest to sensitive receptors. These assumptions represent a worst-case noise scenario as construction activities would routinely be spread throughout the construction site further away from noise sensitive receptors.

Table 7: Project Construction Noise Levels

Construction Phase	Receptor Location			Worst Case Modeled Exterior Noise Level (dBA L_{eq})	Noise Threshold (dBA L_{eq})	Exceeded?
	Land Use	Direction	Distance (feet) [1]			
Site Preparation	Educational	East	470	68.2	80	No
		South	780	63.8	80	No
Grading	Educational	East	470	68.3	80	No
		South	780	63.9	80	No
Construction	Educational	East	470	69.9	80	No
		South	780	65.5	80	No
Paving	Educational	East	470	67.1	80	No
		South	780	62.7	80	No
Architectural Coating	Educational	East	470	54.2	80	No
		South	780	49.8	80	No

1. Per FTA Guidance (Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual, 2018) the equipment distance is assumed at the center of the project.
2. The City does not have a quantitative noise threshold for construction. Therefore, FTA's construction noise threshold are conservatively used for this analysis (FTA, *Transit Noise and Vibration Impact Assessment Manual*, September 2018).

Source: Federal Highway Administration, *Roadway Construction Noise Model,* 2006. Refer to Appendix A for noise modeling results.

Table 7 shows that the maximum construction noise levels would not exceed the applicable FTA construction thresholds. The highest exterior noise level at sensitive receptors would occur during the building construction stage and would be 69.9 dBA which is below the FTA's 80 dBA threshold. Construction equipment would operate throughout the Project site and the associated noise levels would not occur at a fixed location for extended periods of time. Although sensitive uses may be exposed to elevated noise levels during project construction, these noise levels would be acoustically dispersed throughout the Project site, masked by roadway and freeway noise, and not concentrated in one area near surrounding sensitive uses.

The City of Victorville Municipal Code does not establish quantitative construction noise standards and allowable hours of construction. Therefore, FTA's 80 dBA threshold has been utilized in this analysis. Therefore, the impact from construction noise would be less than significant level.

Operations

Implementation of the proposed Project would create new sources of noise in the project vicinity. The major noise sources associated with the project would include the following:

- Mechanical equipment (i.e. trash compactors, air conditioners, etc.);
- Slow moving cars and trucks on the Project site, approaching and leaving the fueling areas, and restaurant's drive-through;
- Parking areas (i.e. car door slamming, car radios, engine start-up, and car pass-by); and
- Off-Site Traffic Noise.

Mechanical Equipment

The Project is surrounded by commercial and residential uses. The nearest sensitive receptor to the Project site is Victor Valley Christian School 325 feet to the east of the Project boundaries. Potential stationary noise sources related to long-term operation of the project site would include mechanical equipment. Mechanical equipment (e.g., heating ventilation and air conditioning [HVAC] equipment) typically generates noise levels of approximately 52 dBA at 50 feet.[2] At the closest sensitive receptors located approximately 325 feet away, mechanical equipment noise would attenuate to 35.7 dBA. Operation of mechanical equipment would not increase ambient noise levels beyond the acceptable compatible land use noise levels. Therefore, the proposed Project would result in a less than significant impact related to stationary noise levels.

Truck Noise

Truck noise would be generated by the trucks' diesel engines, exhaust systems, and brakes during low gear shifting' braking activities while approaching the truck fueling stations. In addition, the Project would also require deliveries of gasoline, diesel, and supplies for the convenience store and the drive-thru restaurant. Typically, heavy truck operations generate a noise level of 68 dBA at a distance of 30 feet. The closest sensitive receptor is located approximately 325 feet to the east; therefore, truck noise would attenuate to approximately 47.3 dBA, well below the City's 70 dBA standard for commercial uses. Noise levels associated with trucks' activities would not exceed the City's standards and impacts would be less than significant.

[2] Elliott H. Berger, Rick Neitzel, and Cynthia A. Kladden, *Noise Navigator Sound Level Database with Over 1700 Measurement Values*, July 6, 2010.

Parking Noise

The proposed Project would provide parking for trucks and passenger vehicles. Traffic associated with parking lots is typically not of sufficient volume to exceed community noise standards, which are based on a time-averaged scale such as the CNEL scale. The instantaneous maximum sound levels generated by a car door slamming, an engine starting up, and car pass-bys range from 60 to 63 dBA at 50 feet[3] would attenuate to 46.7 dBA at the nearest sensitive receptor approximately 325 feet away. It should be noted that parking lot noises are instantaneous noise levels compared to noise standards in the hourly L_{eq} metric, which are averaged over the entire duration of a time period.

Noise levels over time resulting from parking lot activities would be far lower than the reference levels identified above. Parking lot noise would occur within the surface parking lot on-site. It is also noted that parking lot noise occurs at the adjacent properties under existing conditions. Parking lot noise would be consistent with the existing noise in the vicinity and would be masked by background noise from I-15. Noise associated with parking lot activities is not anticipated to exceed the City's noise standards during operation. Therefore, noise impacts from parking lots would be less than significant.

Off-Site Traffic Noise

Implementation of the Project would generate increased traffic volumes along nearby roadway segments. In general, a traffic noise increase of less than 3 dBA is barely perceptible to people, while a 5-dBA increase is readily noticeable.[4] Traffic volumes on Project area roadways would have to approximately double for the resulting traffic noise levels to increase by 3 dBA.[5] Therefore, permanent increases in ambient noise levels of less than 3 dBA would be less than significant. Project related trips would occur along Nisqualli Road and Mariposa Road.

The City of Victorville Traffic Counts shows the total 24-hour directional volume counts (Average Daily Traffic [ADT]) for Mariposa Road north of Nisqualli Road is 12,788. The report also shows 11,987 ADT and 8,662 ADT for Mariposa Road south of Nisqualli Road and Nisqualli Road west of Hesperia Road, respectively.[6] The proposed Project would generate approximately 2,772 net daily vehicle trips, which would not double the existing traffic volumes and would not result in a perceivable noise increase. Therefore, operational noise impacts would be less than significant.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

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3 Hebert G. Kariel, University of Calgary, *Noise in Rural Recreational Environments*, 1991.

4 Federal Highway Administration, *Highway Traffic Noise Analysis and Abatement Policy and Guidance, Noise Fundamentals*, https://www.fhwa.dot.gov/environMent/noise/regulations_and_guidance/polguide/polguide02.cfm, accessed July 12, 2021.

5 California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, 2013.

6 City of Victorville Traffic Counts, *2013-24hour- Directional volume counts taken over a 24-hour period,* 2013.

Threshold 6.2 Would the Project expose persons to or generate excessive ground borne vibration or ground borne noise levels?

Once operational, the Project would not be a source of ground-borne vibration. Increases in ground-borne vibration levels attributable to the proposed Project would be primarily associated with short-term construction-related activities. Construction on the Project site would have the potential to result in varying degrees of temporary ground-borne vibration, depending on the specific construction equipment used and the operations involved.

The Federal Transit Administration (FTA) has published standard vibration velocities for construction equipment operations. In general, the FTA architectural damage criterion for continuous vibrations (i.e., 0.2 in/sec) appears to be conservative. The types of construction vibration impacts include human annoyance and building damage. Human annoyance occurs when construction vibration rises significantly above the threshold of human perception for extended periods of time. Building damage can be cosmetic or structural. Ordinary buildings that are not particularly fragile would not experience any cosmetic damage (e.g., plaster cracks) at distances beyond 30 feet. This distance can vary substantially depending on the soil composition and underground geological layer between vibration source and receiver. In addition, not all buildings respond similarly to vibration generated by construction equipment. For example, for a building that is constructed with reinforced concrete with no plaster, the FTA guidelines show that a vibration level of up to 0.20 in/sec is considered safe and would not result in any construction vibration damage.

Table 8: Typical Construction Equipment Vibration Levels, lists vibration levels at 25 feet for typical construction equipment. Ground-borne vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance. As indicated in **Table 8**, based on FTA data, vibration velocities from typical heavy construction equipment operations that would be used during Project construction range from 0.003 to 0.089 in/sec PPV at 25 feet from the source of activity.

Table 8: Typical Construction Equipment Vibration Levels

Equipment	Peak Particle Velocity at 25 Feet (in/sec)	Peak Particle Velocity at 130 Feet (in/sec)[1]
Large Bulldozer	0.089	0.0075
Caisson Drilling	0.089	0.0075
Loaded Trucks	0.076	0.0064
Rock Breaker	0.059	0.0050
Jackhammer	0.035	0.0030
Small Bulldozer/Tractors	0.003	0.0003

[1] Calculated using the following formula: $PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$
where: PPV_{equip} = the peak particle velocity in in/sec of the equipment adjusted for the distance
PPV_{ref} = the reference vibration level in in/sec from Table 7-4 of the Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018.
D = the distance from the equipment to the receiver

Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018.

The nearest sensitive receptor is an educational use approximately 325 feet to the east and the nearest structure, related to Victor Valley Christian School, is approximately 130 feet or more from the active construction zone. Using the calculation shown in **Table 8**, at 130 feet the vibration velocities from construction equipment would not exceed 0.0075 in/sec PPV, which is below the FTA's 0.20 PPV threshold. It is also acknowledged that construction activities would occur throughout the Project site and would not be concentrated at the point closest to the nearest residential structure. Therefore, vibration impacts associated with the proposed Project would be less than significant.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

Threshold 6.3 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?

The Hesperia Airport, located approximately 8 miles south of the Project site, is the nearest airport. There are no other airports within two miles of the project site. Therefore, there is no impact surrounding the proposed Project concerning airport noise, including from a private airstrip.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

6.2 Cumulative Noise Impacts

Cumulative Construction Noise

The Project's construction activities would not exceed the FTA's noise standards and would not result in a substantial temporary increase in ambient noise levels. Construction noise would be periodic and temporary noise impacts that would cease upon completion of construction activities. The Project would contribute to other proximate construction project noise impacts if construction activities were conducted concurrently. However, based on the noise analysis above, the Project's construction-related noise impacts would be less than significant following the City of Victorville Municipal Code.

Construction activities at other planned and approved projects near the Project site would be required to comply with applicable City rules related to noise and would take place during daytime hours on the days permitted by the applicable Municipal Code, and projects requiring discretionary City approvals would be required to evaluate construction noise impacts, comply with the City's standard conditions of approval, and implement mitigation, if necessary, to minimize noise impacts. Construction noise impacts are by nature localized. Based on the fact that noise dissipates as it travels away from its source, noise impacts would be limited to the Project site and vicinity. Therefore, Project construction would not result in a cumulatively considerable contribution to significant cumulative impacts, assuming such a cumulative impact existed, and impacts in this regard are not cumulatively considerable.

Cumulative Operational Noise

Stationary noise sources of the proposed Project would result in an incremental increase in non-transportation noise sources in the Project vicinity. However, as discussed above, operational noise caused by the proposed Project would be less than significant. Additionally, due to site distance to sensitive receptors cumulative stationary noise impacts would not occur. Similar to the proposed Project, other planned and approved projects would be required to mitigate for stationary noise impacts at nearby sensitive receptors, if necessary. As stationary noise sources are generally localized, there is a limited potential for other projects to contribute to cumulative noise impacts.

No known past, present, or reasonably foreseeable projects would combine with the operational noise levels generated by the Project to increase noise levels above acceptable standards because each project must comply with applicable County/City regulations that limit operational noise. Therefore, the Project, together with other projects, would not create a significant cumulative impact, and even if there was such a significant cumulative impact, the Project would not make a cumulatively considerable contribution to significant cumulative operational noises.

Given that noise dissipates as it travels away from its source, operational noise impacts from on-site activities and other stationary sources would be limited to the Project site and vicinity. Thus, cumulative operational noise impacts from related projects, in conjunction with Project specific noise impacts, would not be cumulatively significant.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

7 REFERENCES

1. California Department of Transportation, *California Vehicle Noise Emission Levels*, 1987.
2. California Department of Transportation, *Traffic Noise Analysis Protocol*, 2020.
3. California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, 2013.
4. California Department of Transportation, *Transportation and Construction Vibration Guidance Manual*, 2020.
5. City of Victorville, *General Plan 2030*.
6. City of Victorville, *Code of Ordinances*, 2021.
7. City of Victorville, City of Victorville Traffic Counts, *2013-24-hour- Directional Volume Counts Taken Over a 24-hour Period*, 2013.
8. Federal Highway Administration, *Highway Traffic Noise Analysis and Abatement Policy and Guidance, Noise Fundamentals*, https://www.fhwa.dot.gov/environMent/noise/regulations_and_guidance/polguide/polguide02.cfm, accessed July 12, 2021.
9. Federal Highway Administration, *Roadway Construction Noise Model*, 2006.
10. Federal Highway Administration, *Roadway Construction Noise Model User's Guide Final Report*, 2006.
11. Federal Interagency Committee on Noise, *Federal Agency Review of Selected Airport Noise Analysis Issues*, 1992.
12. Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018.
13. Kimley-Horn, *Maverik (Nisqualli & Mariposa) Transportation Study*, 2021.
14. Kariel, Hebert G., *University of Calgary, Noise in Rural Recreational Environments*, 1991.
15. United States Environmental Protection Agency, *Protective Noise Levels (EPA 550/9-79-100)*, 1979.

Appendix A

Noise Modeling Results

Noise Measurement Field Data

Project:	Victorville Nisqualli (Maverick)	**Job Number:**	195274001
Site No.:	ST-1	**Date:**	9/1/2021
Analyst:	Kiana Graham/Serena Lin	**Time:**	9:36 - 9:46 AM
Location:	Along Mariposa Road		
Noise Sources:	Cars (I-15N, Mariposa Road)		
Comments:			

Results (dBA):

	Leq:	Lmin:	Lmax:	Peak:
Measurement 1:	66.7	56.7	77.1	91.5

Equipment	
Sound Level Meter:	LD SoundExpert LxT
Calibrator:	CAL200
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	73°
Wind (mph):	13
Sky:	Clear
Bar. Pressure:	29.76 inHg
Humidity:	38%

Photo:

Kimley»Horn

Summary

File Name on Meter	Vic_.001.s		
File Name on PC	LxTse_0005586-20210901 093649-Vic_.00:		
Serial Number	0005586		
Model	SoundExpert® LxT		
Firmware Version	2.404		
User			
Location			
Job Description			
Note			

Measurement

Description			
Start	2021-09-01 09:36:49		
Stop	2021-09-01 09:46:49		
Duration	00:10:00.0		
Run Time	00:10:00.0		
Pause	00:00:00.0		
Pre-Calibration	2021-08-31 14:04:17		
Post-Calibration	None		
Calibration Deviation	---		

Overall Settings

RMS Weight	A Weighting		
Peak Weight	A Weighting		
Detector	Slow		
Preamplifier	PRMLxT1L		
Microphone Correction	Off		
Integration Method	Linear		
OBA Range	Normal		
OBA Bandwidth	1/1 and 1/3		
OBA Frequency Weighting	A Weighting		
OBA Max Spectrum	At LMax		
Overload	122.5 dB		
	A	**C**	**Z**
Under Range Peak	**79.0**	76.0	81.0 dB
Under Range Limit	**25.3**	25.9	31.6 dB
Noise Floor	16.1	16.8	22.5 dB

Results

LAeq	66.7	
LAE	94.5	
EA	315.290 µPa²h	
LApeak (max)	2021-09-01 09:41:36	91.5 dB
LASmax	2021-09-01 09:41:37	77.1 dB

Measurement Report

Report Summary

Meter's File Name	Vic_.001.s		Computer's File Name	LxTse_0005586-20210901 093649-Vic_.001.ldbin
Meter	LxT SE	0005586		
Firmware	2.404			
User			Location	
Job Description				
Note				

Start Time	2021-09-01 09:36:49	Duration	0:10:00.0		
End Time	2021-09-01 09:46:49	Run Time	0:10:00.0	Pause Time	0:00:00.0

Results

Overall Metrics

LA_{eq}	66.7 dB		
LAE	94.5 dB	SEA	--- dB
EA	315.3 µPa²h		
LA_{peak}	91.5 dB	2021-09-01 09:41:36	
LAS_{max}	77.1 dB	2021-09-01 09:41:37	
LAS_{min}	56.7 dB	2021-09-01 09:46:08	
LA_{eq}	66.7 dB		
LC_{eq}	76.8 dB	LC_{eq} - LA_{eq}	10.1 dB
LAI_{eq}	68.4 dB	LAI_{eq} - LA_{eq}	1.6 dB

Exceedances

Exceedances	Count	Duration
LAS > 85.0 dB	0	0:00:00.0
LAS > 115.0 dB	0	0:00:00.0
LApeak > 135.0 dB	0	0:00:00.0
LApeak > 137.0 dB	0	0:00:00.0
LApeak > 140.0 dB	0	0:00:00.0

Community Noise

LDN	LDay	LNight
66.7 dB	66.7 dB	0.0 dB

LDEN	LDay	LEve	LNight
66.7 dB	66.7 dB	--- dB	--- dB

Any Data

	A		C		Z	
	Level	Time Stamp	Level	Time Stamp	Level	Time Stamp
L_{eq}	66.7 dB		76.8 dB		--- dB	
$Ls_{(max)}$	77.1 dB	2021-09-01 09:41:37	--- dB		--- dB	
$LS_{(min)}$	56.7 dB	2021-09-01 09:46:08	--- dB		--- dB	
$L_{Peak(max)}$	91.5 dB	2021-09-01 09:41:36	--- dB		--- dB	

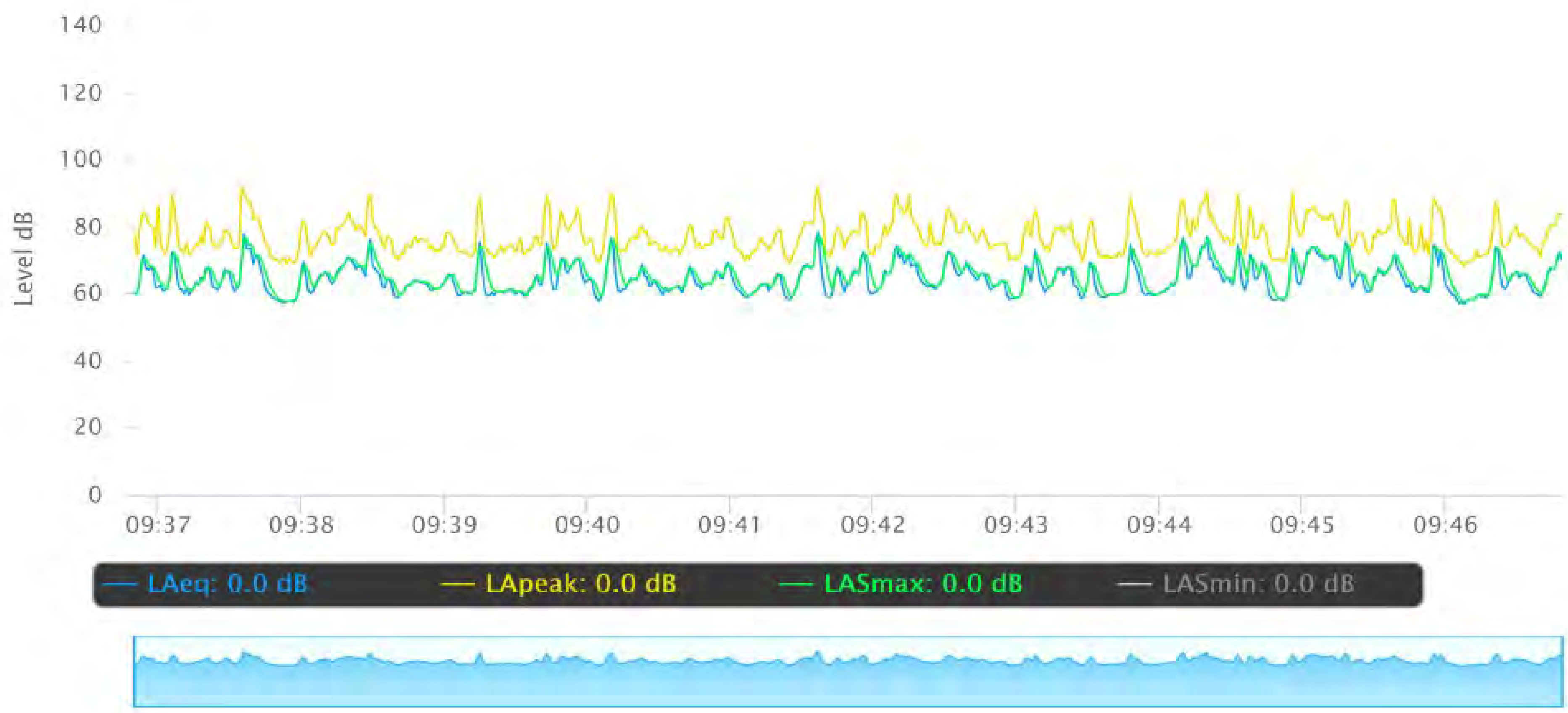
Overloads

Count	Duration	OBA Count	OBA Duration
0	0:00:00.0	0	0:00:00.0

Statistics

LAS 5.0	72.1 dB
LAS 10.0	70.6 dB
LAS 33.3	66.1 dB
LAS 50.0	64.0 dB
LAS 66.6	62.2 dB
LAS 90.0	59.6 dB

Time History



Noise Measurement Field Data

Project:	Victorville Nisqualli (Maverick)	**Job Number:**	195274001
Site No.:	ST-2	**Date:**	9/1/2021
Analyst:	Kiana Graham/Serena Lin	**Time:**	9:50 - 10:00 AM
Location:	Nisqualli Road, I-15 Ramp		
Noise Sources:	Cars on Nisqualli Road/I-15; Police Sirens		
Comments:			

Results (dBA):

	Leq:	Lmin:	Lmax:	Peak:
Measurement 2:	75.7	58.8	93.0	102.1

Equipment	
Sound Level Meter:	LD SoundExpert LxT
Calibrator:	CAL200
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	73°
Wind (mph):	12
Sky:	Clear
Bar. Pressure:	29.76 inHg
Humidity:	36%

Photo:

Kimley»Horn

Summary

File Name on Meter	Vic_.002.s
File Name on PC	LxTse_0005586-20210901 095017-Vic_.00:
Serial Number	0005586
Model	SoundExpert® LxT
Firmware Version	2.404
User	
Location	
Job Description	
Note	

Measurement

Description	
Start	2021-09-01 09:50:17
Stop	2021-09-01 10:00:17
Duration	00:10:00.0
Run Time	00:10:00.0
Pause	00:00:00.0
Pre-Calibration	2021-08-31 14:04:14
Post-Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting			
Peak Weight	A Weighting			
Detector	Slow			
Preamplifier	PRMLxT1L			
Microphone Correction	Off			
Integration Method	Linear			
OBA Range	Normal			
OBA Bandwidth	1/1 and 1/3			
OBA Frequency Weighting	A Weighting			
OBA Max Spectrum	At LMax			
Overload	122.5 dB			
	A	**C**	**Z**	
Under Range Peak	**79.0**	76.0	81.0	dB
Under Range Limit	**25.3**	25.9	31.6	dB
Noise Floor	16.1	16.8	22.5	dB

Results

LA_{eq}	75.7	
LAE	103.5	
EA	2.464 mPa²h	
$LA_{peak\ (max)}$	2021-09-01 09:54:40	102.1 dB
LAS_{max}	2021-09-01 09:54:40	93.0 dB

Measurement Report

Report Summary

Meter's File Name	Vic_.002.s		Computer's File Name	LxTse_0005586-20210901 095017-Vic_.002.ldbin
Meter	LxT SE	0005586		
Firmware	2.404			
User			Location	
Job Description				
Note				

Start Time	2021-09-01 09:50:17	Duration	0:10:00.0		
End Time	2021-09-01 10:00:17	Run Time	0:10:00.0	Pause Time	0:00:00.0

Results

Overall Metrics

LA_{eq}	75.7 dB		
LAE	103.5 dB	SEA	--- dB
EA	2.5 mPa²h		
LA_{peak}	102.1 dB	2021-09-01 09:54:40	
LAS_{max}	93.0 dB	2021-09-01 09:54:40	
LAS_{min}	58.8 dB	2021-09-01 09:51:59	
LA_{eq}	75.7 dB		
LC_{eq}	81.4 dB	LC_{eq} - LA_{eq}	5.7 dB
LAI_{eq}	78.9 dB	LAI_{eq} - LA_{eq}	3.2 dB

Exceedances

Exceedances	Count	Duration
LAS > 85.0 dB	3	0:00:15.8
LAS > 115.0 dB	0	0:00:00.0
LApeak > 135.0 dB	0	0:00:00.0
LApeak > 137.0 dB	0	0:00:00.0
LApeak > 140.0 dB	0	0:00:00.0

Community Noise

	LDN	LDay	LNight	
	75.7 dB	75.7 dB	0.0 dB	
	LDEN	**LDay**	**LEve**	**LNight**
	75.7 dB	75.7 dB	--- dB	--- dB

Any Data

	A		C		Z	
	Level	Time Stamp	Level	Time Stamp	Level	Time Stamp
L_{eq}	75.7 dB		81.4 dB		--- dB	
$Ls_{(max)}$	93.0 dB	2021-09-01 09:54:40	--- dB		--- dB	
$LS_{(min)}$	58.8 dB	2021-09-01 09:51:59	--- dB		--- dB	
$L_{Peak(max)}$	102.1 dB	2021-09-01 09:54:40	--- dB		--- dB	

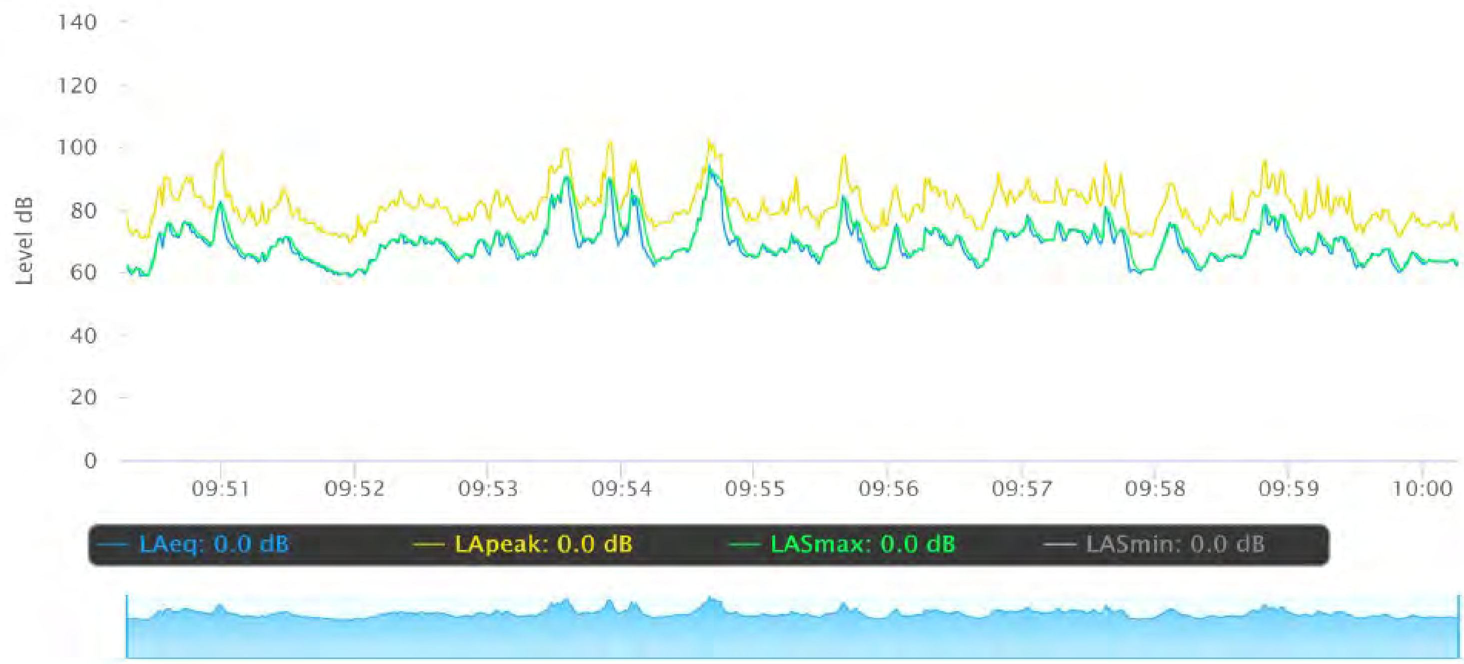
Overloads

Count	Duration	OBA Count	OBA Duration
0	0:00:00.0	0	0:00:00.0

Statistics

LAS 5.0	81.4 dB
LAS 10.0	76.0 dB
LAS 33.3	70.7 dB
LAS 50.0	68.4 dB
LAS 66.6	65.7 dB
LAS 90.0	62.1 dB

Time History



Noise Measurement Field Data

Project:	Victorville Nisqualli (Maverick)	**Job Number:**	195274001
Site No.:	ST-3	**Date:**	9/1/2021
Analyst:	Kiana Graham/Serena Lin	**Time:**	10:06 - 10:16 AM
Location:	Along Nisqualli Road		
Noise Sources:	Cars		
Comments:			

Results (dBA):

	Leq:	Lmin:	Lmax:	Peak:
Measurement 1:	68.7	57.5	76.3	92.8

Equipment	
Sound Level Meter:	LD SoundExpert LxT
Calibrator:	CAL200
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	75°
Wind (mph):	12
Sky:	Clear
Bar. Pressure:	29.76 inHg
Humidity:	36%

Photo:

Kimley»Horn

Summary

File Name on Meter	Vic_.003.s
File Name on PC	LxTse_0005586-20210901 100624-Vic_.00:
Serial Number	0005586
Model	SoundExpert® LxT
Firmware Version	2.404
User	
Location	
Job Description	
Note	

Measurement

Description	
Start	2021-09-01 10:06:24
Stop	2021-09-01 10:16:24
Duration	00:10:00.0
Run Time	00:10:00.0
Pause	00:00:00.0
Pre-Calibration	2021-08-31 14:04:14
Post-Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting			
Peak Weight	A Weighting			
Detector	Slow			
Preamplifier	PRMLxT1L			
Microphone Correction	Off			
Integration Method	Linear			
OBA Range	Normal			
OBA Bandwidth	1/1 and 1/3			
OBA Frequency Weighting	A Weighting			
OBA Max Spectrum	At LMax			
Overload	122.5 dB			
	A	**C**	**Z**	
Under Range Peak	**79.0**	76.0	81.0	dB
Under Range Limit	**25.3**	25.9	31.6	dB
Noise Floor	16.1	16.8	22.5	dB

Results

LAeq	68.7	
LAE	96.5	
EA	491.271 µPa²h	
LApeak (max)	2021-09-01 10:15:07	92.8 dB
LASmax	2021-09-01 10:14:48	76.3 dB

Measurement Report

Report Summary

Meter's File Name	Vic_.003.s	Computer's File Name	LxTse_0005586-20210901 100624-Vic_.003.ldbin
Meter	LxT SE 0005586		
Firmware	2.404		
User		Location	
Job Description			
Note			

Start Time	2021-09-01 10:06:24	Duration	0:10:00.0		
End Time	2021-09-01 10:16:24	Run Time	0:10:00.0	Pause Time	0:00:00.0

Results

Overall Metrics

LA_{eq}	68.7 dB		
LAE	96.5 dB	SEA	--- dB
EA	491.3 µPa²h		
LA_{peak}	92.8 dB	2021-09-01 10:15:07	
LAS_{max}	76.3 dB	2021-09-01 10:14:48	
LAS_{min}	57.5 dB	2021-09-01 10:15:27	
LA_{eq}	68.7 dB		
LC_{eq}	78.8 dB	LC_{eq} - LA_{eq}	10.2 dB
LAI_{eq}	70.0 dB	LAI_{eq} - LA_{eq}	1.3 dB

Exceedances

Exceedances	Count	Duration
LAS > 85.0 dB	0	0:00:00.0
LAS > 115.0 dB	0	0:00:00.0
LApeak > 135.0 dB	0	0:00:00.0
LApeak > 137.0 dB	0	0:00:00.0
LApeak > 140.0 dB	0	0:00:00.0

Community Noise

LDN	LDay	LNight	
68.7 dB	68.7 dB	0.0 dB	
LDEN	**LDay**	**LEve**	**LNight**
68.7 dB	68.7 dB	--- dB	--- dB

Any Data

	A		C		Z	
	Level	Time Stamp	Level	Time Stamp	Level	Time Stamp
L_{eq}	68.7 dB		78.8 dB		--- dB	
$Ls_{(max)}$	76.3 dB	2021-09-01 10:14:48	--- dB		--- dB	
$LS_{(min)}$	57.5 dB	2021-09-01 10:15:27	--- dB		--- dB	
$L_{Peak(max)}$	92.8 dB	2021-09-01 10:15:07	--- dB		--- dB	

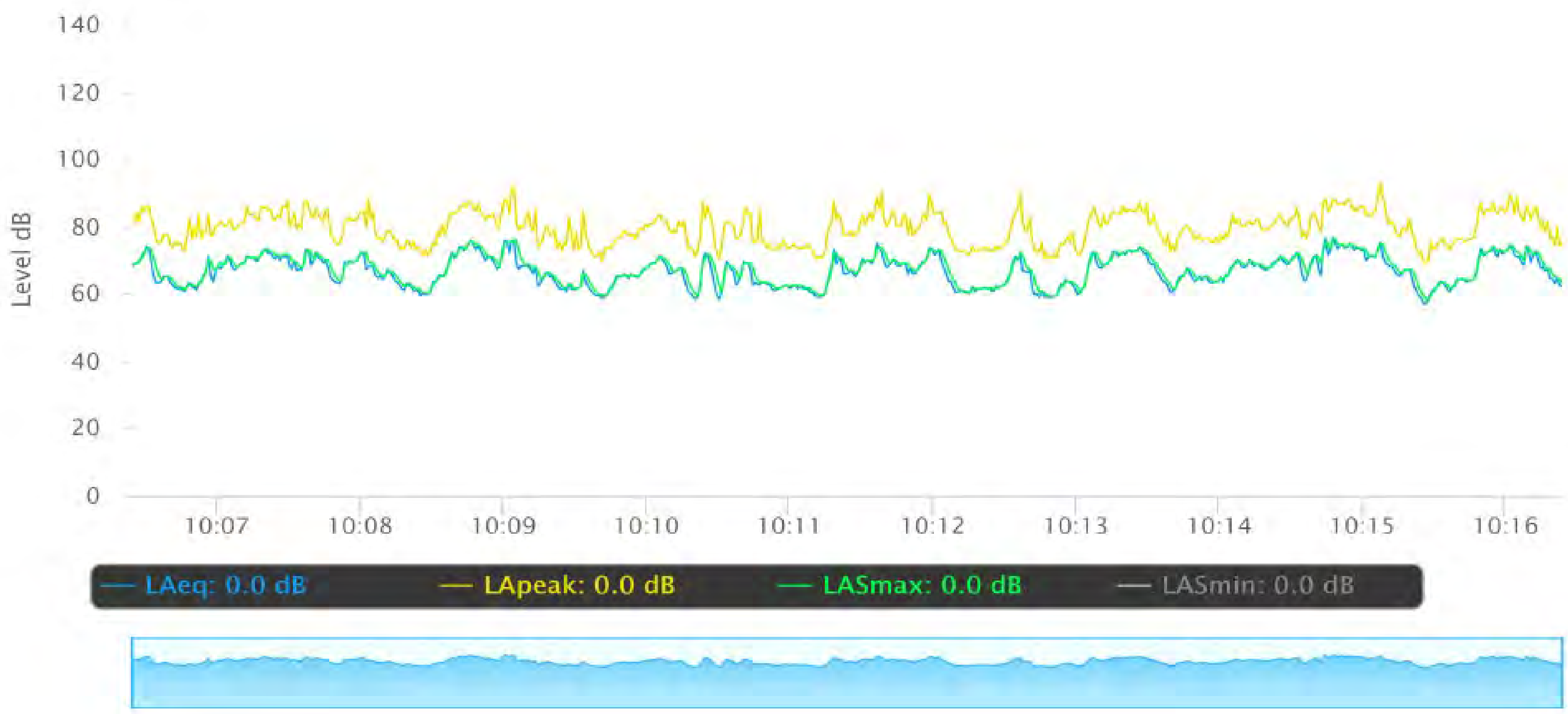
Overloads

Count	Duration	OBA Count	OBA Duration
0	0:00:00.0	0	0:00:00.0

Statistics

LAS 5.0	73.5 dB
LAS 10.0	72.4 dB
LAS 33.3	69.1 dB
LAS 50.0	67.1 dB
LAS 66.6	64.4 dB
LAS 90.0	61.2 dB

Time History



Roadway Construction Noise Model (RCNM),Version 1.1

Report dat 9/7/2021
Case Desc 01 Site Prep

---- Receptor #1 ----

		Baselines (dBA)		
Descriptio	Land Use	Daytime	Evening	Night
East	Residentia	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Tractor	No	40	84		470	0
Tractor	No	40	84		470	0
Tractor	No	40	84		470	0
Tractor	No	40	84		470	0
Dozer	No	40		81.7	470	0
Dozer	No	40		81.7	470	0
Dozer	No	40		81.7	470	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)				
				Day		Evening		Night		Day		Evening		Night
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Tractor		64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer		62.2	58.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer		62.2	58.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer		62.2	58.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	64.5	68.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

		Baselines (dBA)		
Descriptio	Land Use	Daytime	Evening	Night
South	Residentia	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Tractor	No	40	84		780	0
Tractor	No	40	84		780	0
Tractor	No	40	84		780	0
Tractor	No	40	84		780	0
Dozer	No	40		81.7	780	0
Dozer	No	40		81.7	780	0
Dozer	No	40		81.7	780	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)				
				Day		Evening		Night		Day		Evening		Night
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Tractor		60.1	56.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		60.1	56.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		60.1	56.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		60.1	56.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer		57.8	53.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer		57.8	53.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer		57.8	53.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	60.1	63.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

		Baselines (dBA)		
Descriptio	Land Use	Daytime	Evening	Night
	Residentia	0	0	0

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Tractor	No	40	84		470	0
Tractor	No	40	84		470	0
Tractor	No	40	84		470	0
Tractor	No	40	84		470	0
Dozer	No	40		81.7	470	0
Dozer	No	40		81.7	470	0
Dozer	No	40		81.7	470	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)				
			Day		Evening		Night		Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Tractor	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	62.2	58.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	62.2	58.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	62.2	58.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	64.5	68.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report dat 9/7/2021
Case Desc 02 Grading

---- Receptor #1 ----

		Baselines (dBA)		
Descriptio	Land Use	Daytime	Evening	Night
East	Residentia	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	470	0
Dozer	No	40		81.7	470	0
Grader	No	40	85		470	0
Tractor	No	40	84		470	0
Tractor	No	40	84		470	0
Tractor	No	40	84		470	0
Dozer	No	40		81.7	470	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)				
			Day		Evening		Night		Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Excavator	61.2	57.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	62.2	58.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader	65.5	61.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	62.2	58.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	65.5	68.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

		Baselines (dBA)		
Descriptio	Land Use	Daytime	Evening	Night
South	Residentia	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	780	0
Dozer	No	40		81.7	780	0
Grader	No	40	85		780	0
Tractor	No	40	84		780	0
Tractor	No	40	84		780	0
Tractor	No	40	84		780	0
Dozer	No	40		81.7	780	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)				
			Day		Evening		Night		Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Excavator	56.8	52.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	57.8	53.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader	61.1	57.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	60.1	56.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	60.1	56.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	60.1	56.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	57.8	53.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	61.1	63.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
	Residentia	0	0	0

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	470	0
Dozer	No	40		81.7	470	0
Grader	No	40	85		470	0
Tractor	No	40	84		470	0
Tractor	No	40	84		470	0
Tractor	No	40	84		470	0
Dozer	No	40		81.7	470	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)				
			Day		Evening		Night		Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Excavator	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	62.2	58.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	62.2	58.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	62.2	58.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	64.5	68.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report dat 9/7/2021
Case Desc 03 Building Construction

---- Receptor #1 ----

Descriptio	Land Use	Baselines (dBA) Daytime	Evening	Night
East	Residentia	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	470	0
All Other Equipment :	No	50	85		470	0
All Other Equipment :	No	50	85		470	0
All Other Equipment :	No	50	85		470	0
Generator	No	50		80.6	470	0
Tractor	No	40	84		470	0
Tractor	No	40	84		470	0
Tractor	No	40	84		470	0
Welder / Torch	No	40		74	470	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane	61.1	53.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All Other Equipment :	65.5	62.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All Other Equipment :	65.5	62.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All Other Equipment :	65.5	62.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Generator	61.2	58.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch	54.5	50.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	65.5	69.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Descriptio	Land Use	Baselines (dBA) Daytime	Evening	Night
South	Residentia	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	780	0
All Other Equipment :	No	50	85		780	0
All Other Equipment :	No	50	85		780	0
All Other Equipment :	No	50	85		780	0
Generator	No	50		80.6	780	0
Tractor	No	40	84		780	0
Tractor	No	40	84		780	0
Tractor	No	40	84		780	0
Welder / Torch	No	40		74	780	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane	56.7	48.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All Other Equipment :	61.1	58.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All Other Equipment :	61.1	58.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All Other Equipment :	61.1	58.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Generator	56.8	53.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	60.1	56.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	60.1	56.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	60.1	56.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch	50.1	46.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	61.1	65.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

Descriptio	Land Use	Baselines (dBA) Daytime	Evening	Night
	Residentia	0	0	0

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	470	0
All Other Equipment :	No	50	85		470	0
All Other Equipment :	No	50	85		470	0
All Other Equipment :	No	50	85		470	0
Generator	No	50		80.6	470	0
Tractor	No	40	84		470	0
Tractor	No	40	84		470	0
Tractor	No	40	84		0	0
Welder / Torch	No	40		74	0	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane	61.1	53.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All Other Equipment :	65.5	62.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All Other Equipment :	65.5	62.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All Other Equipment :	65.5	62.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Generator	61.2	58.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		-4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch		-4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	65.5	69.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report dat 9/7/2021
Case Desc 04 Paving

---- Receptor #1 ----

		Baselines (dBA)		
Descriptio	Land Use	Daytime	Evening	Night
East	Residentia	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Paver	No	50		77.2	470	0
Paver	No	50		77.2	470	0
Roller	No	20		80	470	0
Roller	No	20		80	470	0
Pavement Scarafier	No	20		89.5	470	0
Pavement Scarafier	No	20		89.5	470	0

			Results										
	Calculated (dBA)			Noise Limits (dBA)						Noise Limit Exceedance (dBA)			
			Day		Evening		Night		Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Paver	57.8	54.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver	57.8	54.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	60.5	53.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	60.5	53.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pavement Scarafier	70	63	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pavement Scarafier	70	63	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	70	67.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

		Baselines (dBA)		
Descriptio	Land Use	Daytime	Evening	Night
South	Residentia	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Paver	No	50		77.2	780	0
Paver	No	50		77.2	780	0
Roller	No	20		80	780	0
Roller	No	20		80	780	0
Pavement Scarafier	No	20		89.5	780	0
Pavement Scarafier	No	20		89.5	780	0

			Results										
	Calculated (dBA)			Noise Limits (dBA)						Noise Limit Exceedance (dBA)			
			Day		Evening		Night		Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Paver	53.4	50.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver	53.4	50.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	56.1	49.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	56.1	49.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pavement Scarafier	65.6	58.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pavement Scarafier	65.6	58.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	65.6	62.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

Descriptio	Land Use	Baselines (dBA) Daytime	Evening	Night
	Residentia	0	0	0

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Paver	No	50		77.2	470	0
Paver	No	50		77.2	470	0
Roller	No	20		80	470	0
Roller	No	20		80	470	0
Pavement Scarafier	No	20		89.5	470	0
Pavement Scarafier	No	20		89.5	470	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)				
			Day		Evening		Night		Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Paver	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	64.5	60.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pavement Scarafier	62.2	58.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pavement Scarafier	62.2	58.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	64.5	68.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report dat 9/7/2021
Case Desc 05 AC

---- Receptor #1 ----

		Baselines (dBA)		
Descriptio	Land Use	Daytime	Evening	Night
East	Residentia	55	50	45

			Equipment			
			Spec	Actual	Receptor	Estimated
	Impact		Lmax	Lmax	Distance	Shielding
Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Compressor (air)	No	40		77.7	470	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)				
			Day		Evening		Night		Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Compressor (air)	58.2	54.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	58.2	54.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

		Baselines (dBA)		
Descriptio	Land Use	Daytime	Evening	Night
South	Residentia	55	50	45

			Equipment			
			Spec	Actual	Receptor	Estimated
	Impact		Lmax	Lmax	Distance	Shielding
Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Compressor (air)	No	40		77.7	780	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)				
			Day		Evening		Night		Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Compressor (air)	53.8	49.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	53.8	49.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
	Residentia	0	0	0

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	470	0

Results

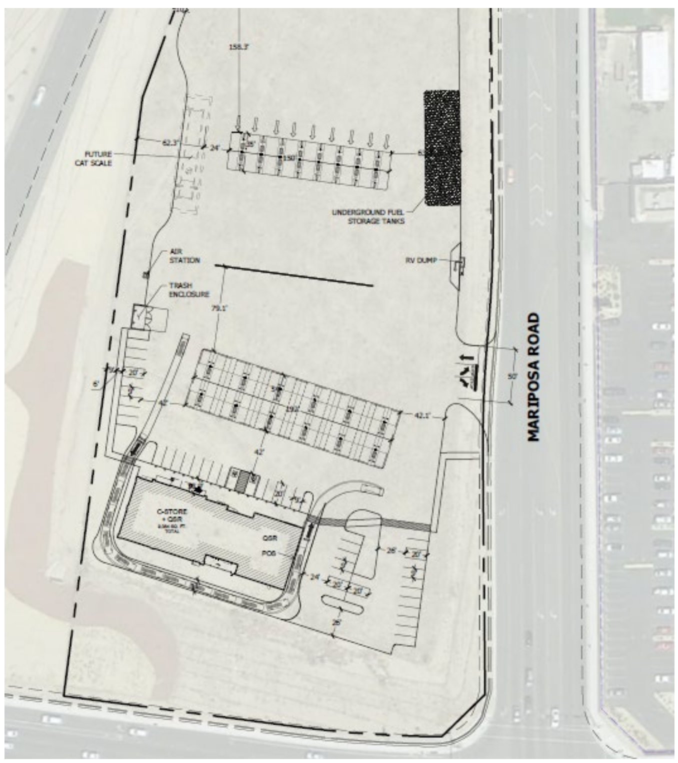
	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)				
			Day		Evening		Night		Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Compressor (air)	61.1	53.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	65.5	69.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Appendix J – Traffic Study

Maverik (Nisqualli & Mariposa) Transportation Study

CITY OF VICTORVILLE



July 2021

Prepared By:

Kimley»Horn

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Appendices

INTRODUCTION

This traffic study has been prepared in accordance to the City of Victorville Traffic Study Guidelines to address the traffic-related effects of the proposed Maverik (the project) truck stop, gas station with convenience store, and quick serve restaurant site located on the northwest corner of the Nisqualli Road and Mariposa Road intersection in the City of Victorville. This report includes a description of existing traffic conditions in the surrounding area, estimated project trip generation and distribution, future traffic growth, and an assessment of the roadway system operations before and after implementation of the proposed project.

PROJECT DESCRIPTION

The proposed project site is a vacant 6.02 acre lot located at the northwest corner of Nisqualli Road and Mariposa Road, just east of Interstate-15. The project is a 2,981 square-foot quick serve restaurant with drive-through, a 6,103 square-foot convenience store with gas pumps, and a truck stop with 9 fueling stations. The project proposes two unsignalized site access driveways along Mariposa Road which will provide access for vehicles traveling northbound and southbound along Mariposa Road. **Figure 1** is the Vicinity Map showing the project location with the surrounding roadway network. **Figure 2** shows the project site plan.

The current zoning for the site is General Commercial (C-2T) per the online City of Victorville Zoning and Land Use Checker.

STUDY AREA AND ANALYSIS SCENARIOS

The study area was defined in consultation with the City staff and consists of 1 signalized intersection and 3 unsignalized intersections. These locations are listed below and are illustrated in **Figure 3:**

1. Nisqualli Road and Mariposa Road (Signalized)
2. Mariposa Road and South Site Driveway (Unsignalized – proposed – full access)
3. Mariposa Road and School Driveway (Unsignalized – existing)
4. Mariposa Road and North Site Driveway (Unsignalized – proposed – partial access)

The following scenarios have been analyzed in this study:

- Existing (2021) Conditions
- Opening Year (2023) Conditions
- Opening Year (2023) plus Project Conditions
- Future Year (2031) Conditions
- Future Year (2031) plus Project Conditions

A queuing analysis for the northbound direction of Mariposa Road for vehicles entering the site and for the southbound left-turn at Mariposa Road and Nisqualli Road is detailed later in this report as well. **Appendix A** contains the approved project scoping letter. It should be noted that the site plan for the project has changed since the scoping letter was approved and therefore does not reflect the project's land uses. However, methodologies used for this traffic study is consistent with the approved scoping letter.

CEQA CONSIDERATIONS

In 2018, the California Natural Resources Agency certified and adopted the California Environmental Quality Act (CEQA) Guidelines update. This included California Senate Bill 743 (SB 743) which requires project transportation impacts to be measured by vehicle miles traveled (VMT) analysis rather than level of service (LOS) analysis. State guidelines now require all projects, unless the environmental document was circulated for public review before July 1, 2020, to be analyzed using VMT metrics.

Based on the screening criteria outlined in the City of Victorville Vehicle Miles Traveled (VMT) Analysis Guidelines (Resolution No. 20-031), retail land uses under 122,000 square feet are screened out of VMT analysis, therefore the project is screened out of VMT analysis using the project's land use type.

This report, based on coordination with the City of Victorville staff, is a local access study using LOS metrics that is performed for the adjacent signalized intersection and project driveways. This evaluation will adhere to the City's General Guidelines for Conducting Traffic Studies and Determination of Intersection Level of Service and Improvement Needs (dated January 20, 2005).

FIGURE 1 - Vicinity Map

FIGURE 2 - Site Plan

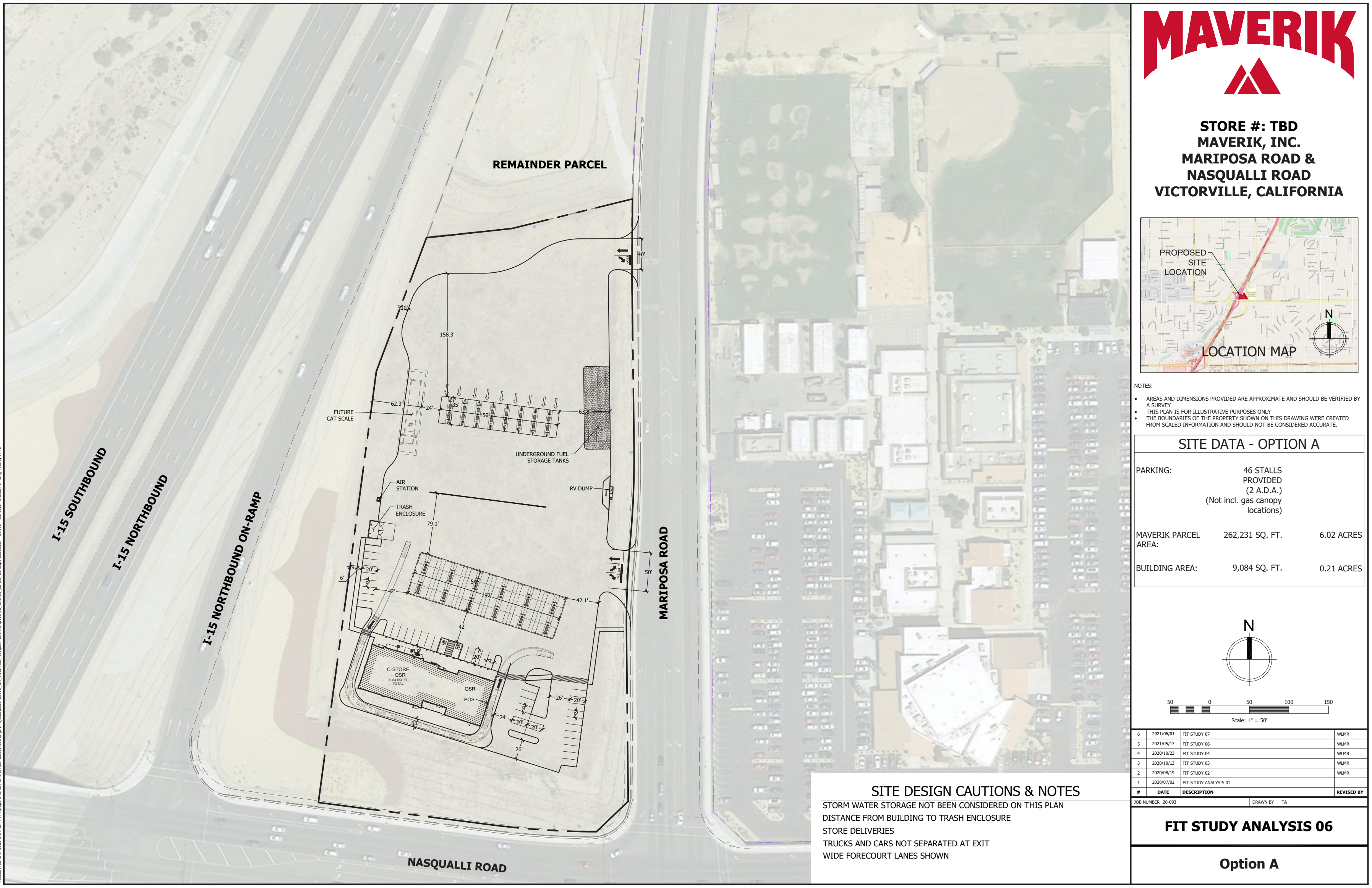
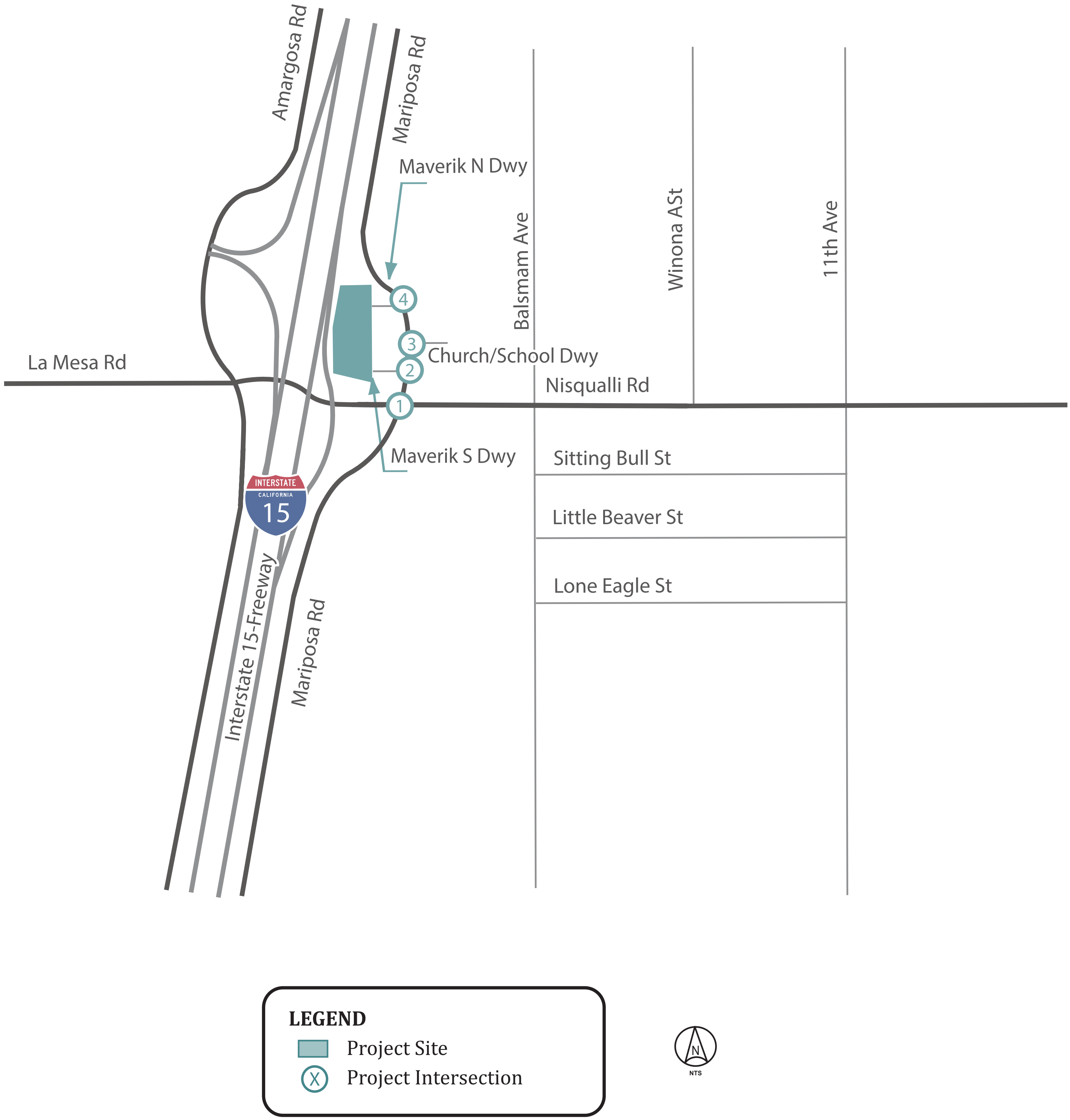


FIGURE 3 - Study Intersections



INTERSECTION ANALYSIS METHODOLOGY

INTERSECTION ANALYSIS – HCM METHODOLOGY

Peak hour intersection operations were evaluated using the methodology outlines in the Highway Capacity Manual (HCM) 6th Edition, consistent with the requirements of the City of Victorville. The intersection analysis was conducted using the Synchro software program.

Per the HCM Methodology, Level of Service (LOS) for signalized intersections and all-way stop-controlled intersections is defined in terms of average vehicle delay. Specifically, LOS criteria are stated in terms of the average control delay per vehicle during the peak hours. The average control delay includes initial deceleration delay, queue move-up time, and final acceleration time in addition to the stop delay.

The procedure for unsignalized intersection analysis determines the average total delay, expressed in seconds of delay per vehicle, for left turns from the major street and from the stop-controlled minor street traffic stream. Delay values are calculated based on the relationship between traffic on the major street and the availability of acceptable “gaps” in this stream through which conflicting traffic movements can be made.

Table 1 provides a description of the operating characteristics of each Level of Service and **Table 2** provides the average seconds of delay for signalized and unsignalized intersections corresponding to each LOS definition.

Table 1: HCM LOS Definition

LOS	Description
A	The volume-to-capacity ratio is low and either progression is exceptionally favorable or the cycle length is very short. If it is due to favorable progression, most vehicles arrive during the green indication and travel through the intersection without stopping.
B	Progression is highly favorable or the cycle length is short. More vehicles stop than with LOS A.
C	Progression is favorable or the cycle length is moderate. The number of vehicles stopping is significant, although many vehicles still pass through the intersection without stopping.
D	Progression is favorable or the cycle length is moderate. The number of vehicles stopping is significant, although many vehicles still pass through the intersection without stopping.
E	The volume-to-capacity ratio is high, progression is unfavorable, and the cycle length is long. Individual cycle failures are frequent.
F	The volume-to-capacity ratio is very high, progression is very poor, and the cycle length is long. Most cycles fail to clear the queue.

Table 2: Level of Service Criteria for Signalized and Unsignalized Intersections

Level of Service	Signalized Intersection (Average delay per vehicle, in seconds) [1]	Unsignalized Intersections (Average delay per vehicle, in seconds) [2]
A	≤ 10	0 – 10
B	> 10 – 20	> 10 – 15
C	> 20 – 35	> 15 – 25
D	> 35 – 55	> 25 – 35
E	> 55 – 80	> 35 – 50
F	> 80	> 50

[1] Source: 6th Edition Highway Capacity Manual, Chapter 19, Page 16, Exhibit 19-8
[2] Source: 6th Edition Highway Capacity Manual, Chapter 20, Page 6, Exhibit 20-2

According to the City of Victorville's General Plan, an acceptable level of service performance is D for intersections. This will serve as a guideline for identifying operational deficiencies and recommending improvements.

QUEUING ANALYSIS

According to the City of Victorville Traffic Study Guidelines, queue lengths shall be calculated on a per lane basis using vehicle spacing of 20 feet. The design queue shall be 1.5 times the average queue at the beginning of Green.

A queuing analysis was completed for northbound vehicles entering the site to ensure that the queuing did not interfere or spill back into the Nisqualli Road and Mariposa Road intersection. A queuing analysis was also completed for the southbound left-turn at the Nisqualli Road and Mariposa Road intersection to ensure the queue did not back into the project driveways. Results for both Opening Year and Future Year are presented in this report. This analysis was done using Simtraffic 10 which is part of the Synchro Studio.

The results of the queuing analysis are presented later in the report in the Site Access and Circulation section.

EXISTING TRAFFIC CONDITIONS

Existing turning movement counts were collected at all existing study intersections on February 10, 2021. The City of Victorville approved existing turning movement counts for use in this analysis on February 17, 2021. Traffic volume counts can be found in **Appendix B**. Existing lane configuration and traffic control for the study intersections are illustrated in **Figure 4** and **Figure 5** shows the existing conditions turning movement counts at the study intersections.

EXISTING STREET SYSTEM

Regional access to the site is primarily provided by Interstate 15 Freeway, located adjacent to the project site to the west. The following provides a description of the roadways surrounding the project site.

Nisqualli Road is classified as an east-west super arterial by the City of Victorville Circulation Element Interactive Map Viewer between Interstate 15 in the west Balsam Avenue in the east. The roadway spans between Interstate 15 in the west, where it turns into La Mesa Road west of this point, and dead ends in the east near the city limit. The posted speed limit for Nisqualli Road is 45 mph both ways and there are three through lanes in each direction. On-street parking is not permitted on Nisqualli Road near the project site. There are bike lanes and bike “sharrows” for the eastbound and westbound directions.

Mariposa Road is classified as a north-south arterial by the City of Victorville Circulation Element Interactive Map Viewer that stretches between Palmdale Road/Seventh Street in the north and beyond the city limit in the south. The posted speed limit for Mariposa Road is 45 mph south of Nisqualli Road and 50 mph north of Nisqualli Road. There are two through lanes in each direction with a two-way left-turn (TWLTL) painted median. On-street parking is not permitted on Mariposa Road near the project site.

EXISTING TRANSIT SERVICE

Transit service to the project area is provided by Victor Valley Transit Authority (VVTA), which operates as Victor Valley Transit, and serves Victorville, Barstow, and other nearby cities by providing local and commuter buses. The bus stops closest to the project site are:

- Northeast corner of Nisqualli/Mariposa – 50: Victorville – Hesperia Post Office
- South leg of Nisqualli/Mariposa – 68: Hesperia Victor Valley Mall

Descriptions of the bus route serving the project area is provided below.

VVT Route 50 operates in the cities of Victorville and Hesperia, traveling mainly along Nisqualli Road and Mariposa Road in the project vicinity. Route 50 operates on weekdays from approximately 6:00 AM to 8:00 PM with approximately 1-hour headways, Saturdays from approximately 7:00 AM to 7:00 PM with 1-hour headways, and Sundays from approximately 8:00 AM to 5:00 PM with 1-hour headways.

VVT Route 68 operates in the cities of Victorville and Hesperia, traveling mainly along Nisqualli Road and Mariposa Road in the project vicinity. Route 68 operates on weekdays from approximately 6:30 AM to 8:30 PM with approximately 1-hour headways, Saturdays from approximately 7:30 AM to 7:30 PM with 1-hour headways, and Sundays from approximately 8:30 AM to 5:30 PM with 1-hour headways.

FIGURE 4 - Existing Lane Configuration Diagrams

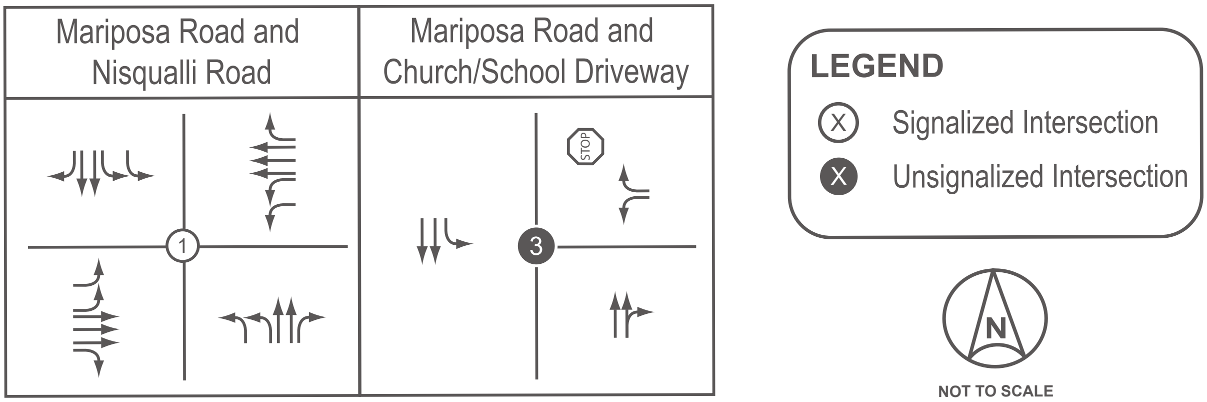
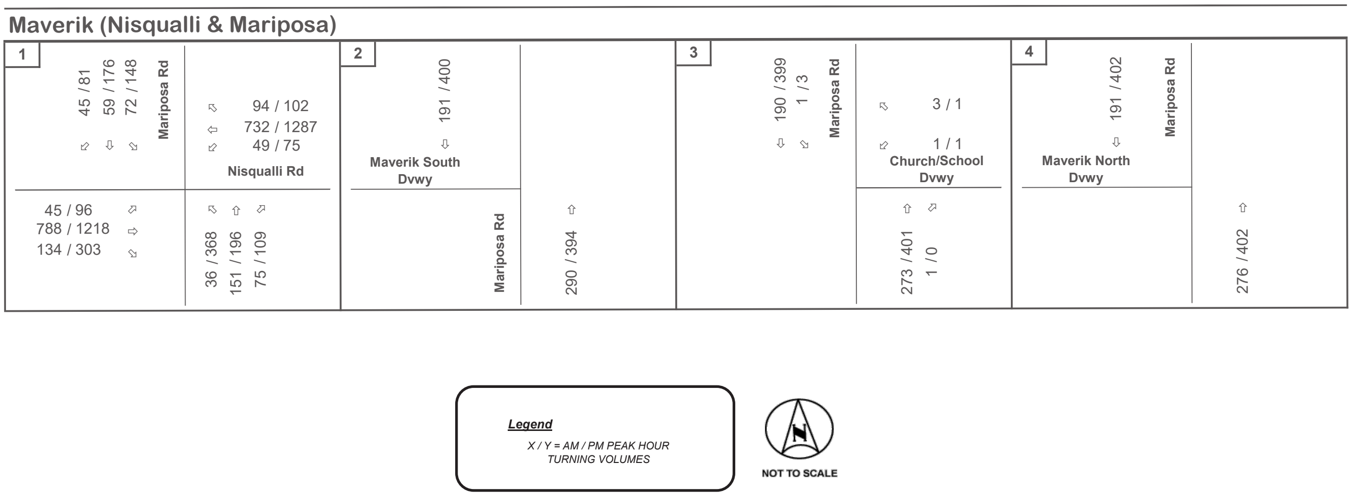


FIGURE 5 - Existing Turning Movement Counts



EXISTING OPERATING CONDITIONS

Intersection Level of Service analysis was conducted for the morning and evening peak hours using the analysis procedures and assumptions described previously in this report. The results are shown below in **Table 3.**

Table 3: Existing Peak-Hour Level of Service Summary

Intersection		Traffic Control	Peak Hour	Existing	
				Delay (a)	LOS (b)
1	Mariposa Rd & Nisqualli Rd	Signal	AM	15.4	B
			PM	27.9	C
3	Mariposa Rd & Church/School Driveway	One-Way Stop	AM	9.6	A
			PM	11.0	B

Notes
(a) Delay refers to the average control delay for the entire intersection, measured in seconds per vehicle. At a two-way stop-controlled intersection, delay refers to the worst movement.
(b) LOS calculations are based on the methodology outlined in the *Highway Capacity Manual 6th Edition* and performed using Synchro 10.

Review of this table indicates that all study intersections currently operate at an acceptable Level of Service in both peak hours.

Copies of the intersection analysis worksheets are provided in ***Appendix C***.

OPENING YEAR (2023) CONDITIONS

BASE CONDITIONS

The project Opening Year is anticipated to be 2023. Opening Year Conditions are Existing Conditions plus traffic from other development projects within one mile of the project site, as provided by City staff. “Other Projects” consist of development projects that have been approved but are not yet constructed/occupied, and projects that are in various stages of the application and approval process but have not yet been approved.

OTHER PROJECTS TRIP GENERATION

Trip Generation information for the Other Projects was obtained from approved traffic studies, where available; and was developed by Kimley-Horn if approved traffic studies were not available. A summary of Other Projects in the project vicinity and the trip generation associated with each is provided on **Table 4**.

The other project intersection volumes and locations are shown on **Figure 6**, and the resulting combined opening year and other project volumes are shown on **Figure 7**.

Table 4: Summary of Other Projects in Project Vicinity

						AM Peak-Hour					PM Peak-Hour				
Project Name	**Location**	**Land Use**	**Units[1]**	**Trip Rate[2]**	**Daily Trips**	**% of ADT[2]**	**In:Out Ratio[2]**	**In**	**Out**	**Total**	**% of ADT[2]**	**In:Out Ratio[2]**	**In**	**Out**	**Total**
						Cumulative Trips									
Proposed															
86-ROOM HOTEL	NORTHEAST CORNER OF MARIPOSA ROAD (ARTERIAL) AND TALPA STREET (LOCAL)	Hotel	86 rm	8.36 / rm	719	6%	0.59 : 0.41	24	16	40	7%	0.51 : 0.49	26	26	52
		Subtotal			**719**			**24**	**16**	**40**			**26**	**26**	**52**
EXPANSION OF SOUTHWEST GAS UTILITY OFFICE SPACE AND NEW WAREHOUSE BUILDING ON PROPERTY	13471 MARIPOSA ROAD	Warehousing	26 ksf	1.74 / ksf	44	10%	0.77 : 0.23	3	1	4	11%	0.27 : 0.73	1	4	5
		General Office Building	25 ksf	9.74 / ksf	246	12%	0.86 : 0.14	25	4	29	12%	0.16 : 0.84	5	24	29
		Subtotal			**291**			**28**	**6**	**34**			**6**	**28**	**34**
PARCEL DELIVERY SERVICE WITHIN EXISTING COMMERCIAL BUILDING	15272 BEAR VALLEY ROAD	Warehousing	132 ksf	1.74 / ksf	230	10%	0.77 : 0.23	17	5	22	11%	0.27 : 0.73	7	18	25
		Subtotal			**230**			**17**	**5**	**22**			**7**	**18**	**25**
76-ROOM HOTEL	NORTHWEST CORNER OF MONARCH BLVD AND COTTONWOOD AVE.	Hotel	76 rm	8.36 / rm	635	6%	0.59 : 0.41	21	15	36	7%	0.51 : 0.49	23	23	46
		Subtotal			**635**			**21**	**15**	**36**			**23**	**23**	**46**
NET CUMULATIVE PROJECTS TRIP GENERATION =					**1,875**			**90**	**42**	**132**			**62**	**95**	**157**

Note:
1. DU = dwelling unit; ksf = one thousand square feet
2. Trip rates references from ITE Trip Generation, 10th Edition.

FIGURE 6 - Other Project Volumes

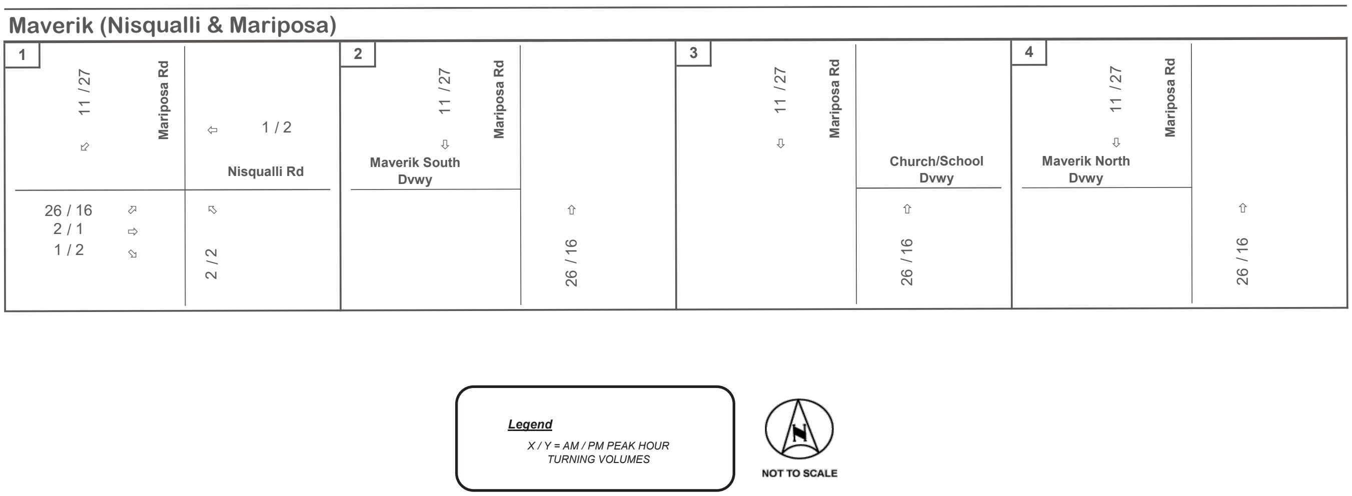
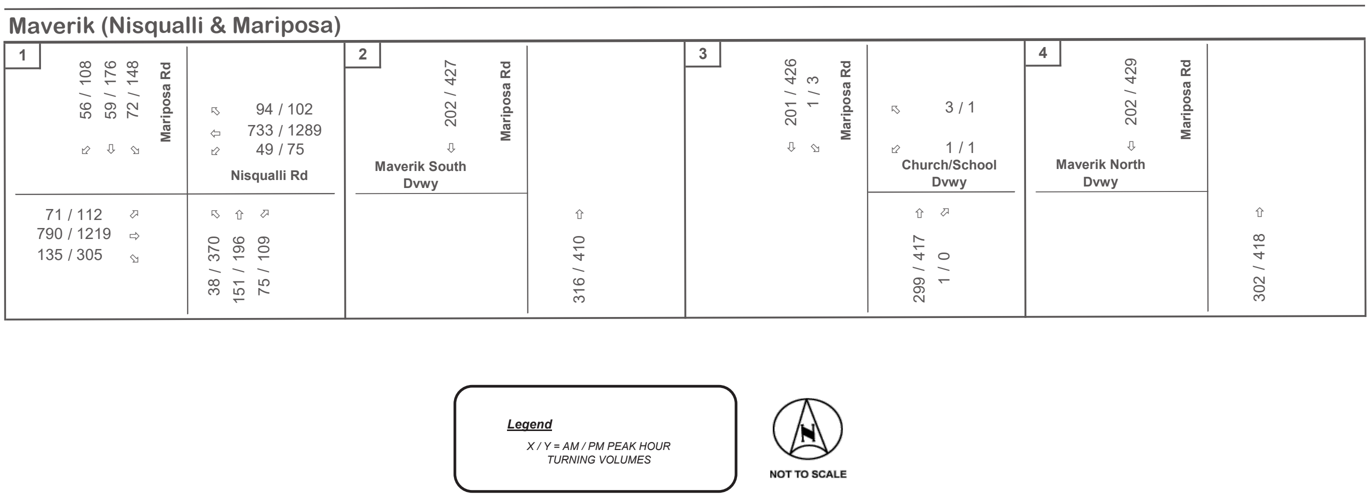


FIGURE 7 - Opening Year Plus Other Project Volumes



OPENING YEAR OPERATING CONDITIONS

Intersection Level of Service analysis was conducted for the morning and evening peak hours using the analysis procedures and assumptions described previously in this report. The results are shown below in **Table 5.**

Table 5: Opening Year Peak-Hour Level of Service Summary

Intersection		Traffic Control	Peak Hour	Opening Year	
				Delay (a)	LOS (b)
1	Mariposa Rd & Nisqualli Rd	Signal	AM	14.8	B
			PM	25.8	C
3	Mariposa Rd & Church/School Driveway	One-Way Stop	AM	9.6	A
			PM	11.1	B

Notes
(a) Delay refers to the average control delay for the entire intersection, measured in seconds per vehicle. At a two-way stop-controlled intersection, delay refers to the worst movement.
(b) LOS calculations are based on the methodology outlined in the *Highway Capacity Manual* 6th Edition and performed using Synchro 10

Review of this table indicates that all study intersections would continue to operate at an acceptable Level of Service in both peak hours.

Copies of the intersection analysis worksheets are provided in ***Appendix C***.

PROJECT TRAFFIC

PROJECT TRIP GENERATION

Trip generation estimates for the Maverik project site are based on daily and peak hour trip generation rates obtained from the Institute of Transportation Engineers (ITE) Trip Generation Manual (10th Edition):

- ITE Land Use 934: Fast-Foot Restaurant with Drive-Through Window
- ITE Land Use 960: Super Convenience Market/Gas Station
- ITE Land USE 950: Truck Stop

Daily, AM peak hour, and PM peak hour trips were estimated for the proposed 2,981 square-foot quick serve restaurant, 6,103 square-foot convenience store with gas pumps, and a truck stop with 9 fueling stations on the currently unoccupied site. Daily trip rate for the truck stop use was developed based on data from similar sites in the region.

Passenger car trips were estimated for the super convenience market with gas station and quick serve restaurant land uses. The truck stop land use was estimated to generate only truck trips and as such, a passenger car equivalent (PCE) factor was applied to the truck stop trips (3.0 PCE for 4+-axle trucks) to determine the total PCE trips to be generated by the truck stop land use.

Trip rates and the estimated project trip generation are shown on **Table 6**. Passenger car trip generation for the super convenience market with gas station and quick serve restaurant land uses is shown in **Table 7.** Truck stop trip generation is shown in **Table 8**, and total project trip generation is shown in **Table 9**.

Table 6: Trip Generation Rates

Land Use	Source	Units		Daily Trip Rate	AM Peak Hour Rate				PM Peak Hour Rate			
					Trip Rate	In	:	Out	Trip Rate	In	:	Out
Fast-Food Restaurant w Drive-Through Window	ITE Code 934	2.981	KSF	470.95	40.19	51%	:	49%	32.67	52%	:	48%
Super Convenience Market/Gas Station	ITE Code 960	6.103	KSF	837.58	83.14	50%	:	50%	69.28	50%	:	50%
Truck Stop	Data (a)/ITE Code 950	9	Truck FP	88.89	7.18	51%	:	49%	8.41	49%	:	51%

Notes

KSF = 1000 sf

AM and/or PM rates correspond to peak of adjacent street traffic

Trip Generation data for ITE Codes from *ITE Trip Generation, 10th Edition*

(a) Daily trip rates developed based on data from similar sites within the region. Peak hour trip rates based on ITE.

Table 7: Project Passenger Car Trip Generation

Proposed Land Use (a)	Units	Daily Trips	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Fast-Food Restaurant with Drive-Through (b)	2.981 KSF	1,404	61	59	120	50	47	97
Internal Capture (c) (Daily: 13%, AM: 12%, PM: 13%)		*-183*	*-7*	*-7*	*-14*	*-7*	*-6*	*-13*
Net Driveway Trips – Gas Station with Convenience Market		1,221	54	52	106	43	41	84
Pass-By Trips (d) (Daily: 50%, AM: 49%, PM: 50%)		*-611*	*-27*	*-25*	*-52*	*-22*	*-20*	*-42*
Diverted Trips (e) (Daily: 25%, AM: 28%, PM: 23%)		*-305*	*-15*	*-15*	*-30*	*-10*	*-9*	*-19*
Net Primary Trips – Super Convenience Market/Gas Station		***305***	***12***	***12***	***24***	***11***	***12***	***23***
Super Convenience Market/Gas Station (b)	6.103 KSF	5,112	254	253	507	212	211	423
Internal Capture (c) (Daily: 13%, AM: 12%, PM: 13%)		*-665*	*-31*	*-30*	*-61*	*-28*	*-27*	*-55*
Net Driveway Trips – Gas Station with Convenience Market		4,447	223	223	446	184	184	368
Pass-By Trips (d) (Daily: 25%, AM: 45%, PM: 50%)		*-1,112*	*-101*	*-100*	*-201*	*-92*	*-92*	*-184*
Diverted Trips (e) (Daily: 26%, AM: 21%, PM: 31%)		*-1,156*	*-47*	*-47*	*-94*	*-57*	*-57*	*-114*
Net Primary Trips – Super Convenience Market/Gas Station		***2,179***	***75***	***76***	***151***	***35***	***35***	***70***
Net Primary Trips		***2,484***	***87***	***88***	***175***	***46***	***47***	***93***

Notes
(a) Passenger Car trips include trips to 6.103 ksf Super Convenience Market/Gas Station and 2.981 ksf Fast-Foot Restaurant with Drive-Through
(b) Trip Generation data from ITE Trip Generation Manual, 10th Edition
(c) Internal capture rates from ITE Trip Generation Handbook, 3rd Edition NCHRP 684 Internal Trip Capture Estimation Tool
(d) Pass-by rates from ITE Trip Generation Handbook, 3rd Edition for ITE LU 934 Fast-Food Restaurant with Drive-Through and ITE LU 945 Gasoline/Service Station With Convenience Market
(e) Diverted trip rates from ITE Trip Generation Handbook, 3rd Edition for ITE LU 934 Fast-Food Restaurant with Drive-Through and ITE

Table 8: Truck Trip Generation

Proposed Land Use	Units	Daily Trips (a)	AM Peak Hour (b)			PM Peak Hour (b)		
			In	Out	Total	In	Out	Total
Truck Stop	9 Fueling Positions	800	33	32	65	37	39	76
Internal Capture (c) 0%		*0*	*0*	*0*	*0*	*0*	*0*	*0*
Net Driveway Trips – Truck Stop		800	33	32	65	37	39	76
Net Driveway Trips in PCE (PCE=3.0)		2,400	99	96	195	111	117	228
Pass-By Trips (d) (Daily: 5%, AM: 5%, PM: 5%)		*-40*	*-2*	*-1*	*-3*	*-2*	*-2*	*-4*
Diverted Trips (e) (Daily: 59%, AM: 62%, PM: 56%)		*-472*	*-20*	*-20*	*-40*	*-21*	*-22*	*-43*
Net Primary Trips – Truck Stop		***288***	***11***	***11***	***22***	***14***	***15***	***29***
Net Primary Trips in PCE (PCE=3.0)		***864***	***33***	***33***	***66***	***42***	***45***	***87***

Notes
(a) Truck trips include trips to the Truck Stop land use portion only, using daily trip information obtained from similar faclilities
(b) Peak hour information estimated using peak hour percentages from ITE Trip Generation Manual, 10th Edition
(c) No internal capture was assumed for the Truck Stop land use, as a truck stop is assumed to include a variety of services
(d) As there was no supporting data available to define the number of pass-by trips, pass-by rates were estimated to be 5%
(e) As there was no supporting data available to define the number of pass-by trips, diverted rates were estimated to be similar to a Super Convenience Market with Gas Station

Table 9: Total Project Trip Generation

	Daily Trips	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Total Primary Trips							
Fast-Food Restaurant with Drive-Through	305	12	12	24	11	12	23
Super Convenience Market/Gas Station	2,179	75	76	151	35	35	70
Truck Stop (PCE = 3.0)	864	33	33	66	42	45	87
Total Primary Trip Generation	**3,348**	**120**	**121**	**241**	**88**	**92**	**180**
Total Driveway Trips							
Fast-Food Restaurant with Drive-Through	1,221	54	52	106	43	41	84
Super Convenience Market/Gas Station	4,447	223	223	446	184	184	368
Truck Stop (PCE = 3.0)	2,400	99	96	195	111	117	228
Total Driveway Trip Generation	**8,068**	**376**	**371**	**747**	**338**	**342**	**680**

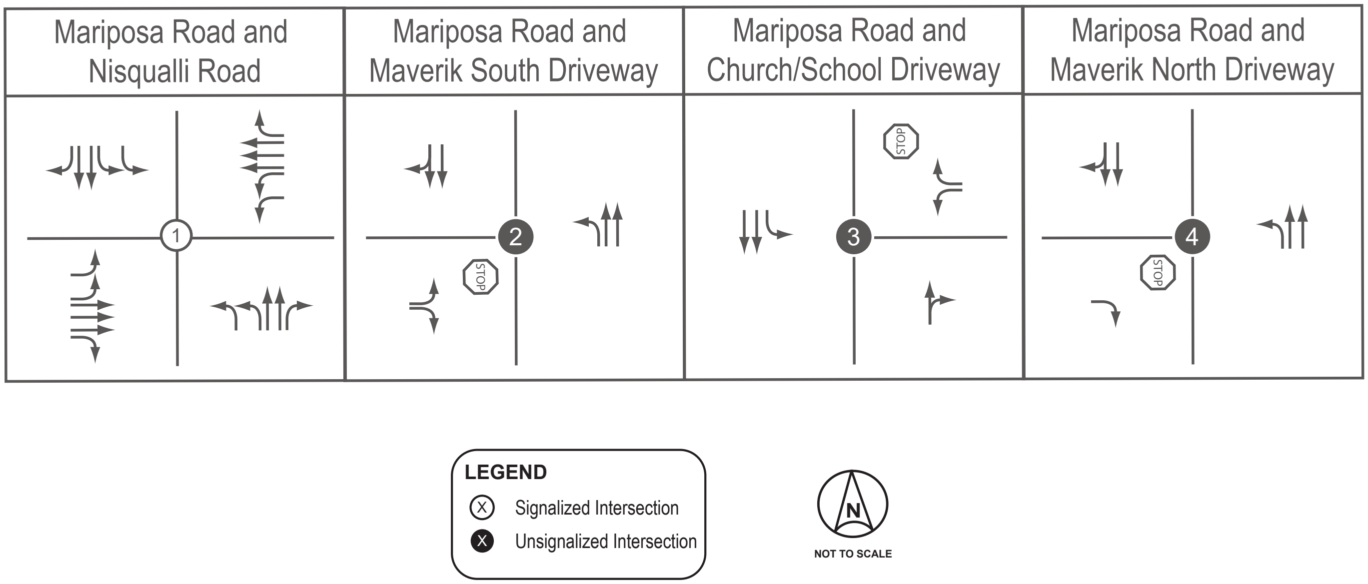
TRIP DISTRIBUTION AND ASSIGNMENT

Project trip distribution assumptions for the project site were developed taking into account the proposed site use, and routes to and from the freeway system. Separate distribution patterns were assumed for passenger car trips and truck trips. Primary trips are new vehicle trips that are assumed to be added to the network as a result of development of the project site. Separate project trip distributions and assignment were developed for diverted and pass-by trips for both passenger cars and trucks. Diverted trip are defined as vehicle trips that are already on the network and would make a short diversion to visit the project site, resulting in new trips at select study intersections. Pass-by trips are defined as trips already on the network near the project site that would enter into the project site using the project driveways. Pass-by truck trips to the site were assumed to occur directly from Mariposa Road. The majority of passenger cars pass-by trips were assumed to make a short diversion from Nisqualli Road to the project site, as it is more likely pass-by trips would originate on Nisqualli Road and access the site by making a short diversion onto Mariposa.

Proposed lane configuration with development of the project is shown in **Figure 8**.

Trip distribution and assignment for passenger car primary, diverted, and pass-by trips are shown on **Figure 9**. Trip distribution and assignment for primary, diverted and pass-by truck trips are shown on **Figure 10**. **Figure 11** shows the total project trip assignment and overall primary distribution.

FIGURE 8 - Proposed Lane Configuration Diagrams



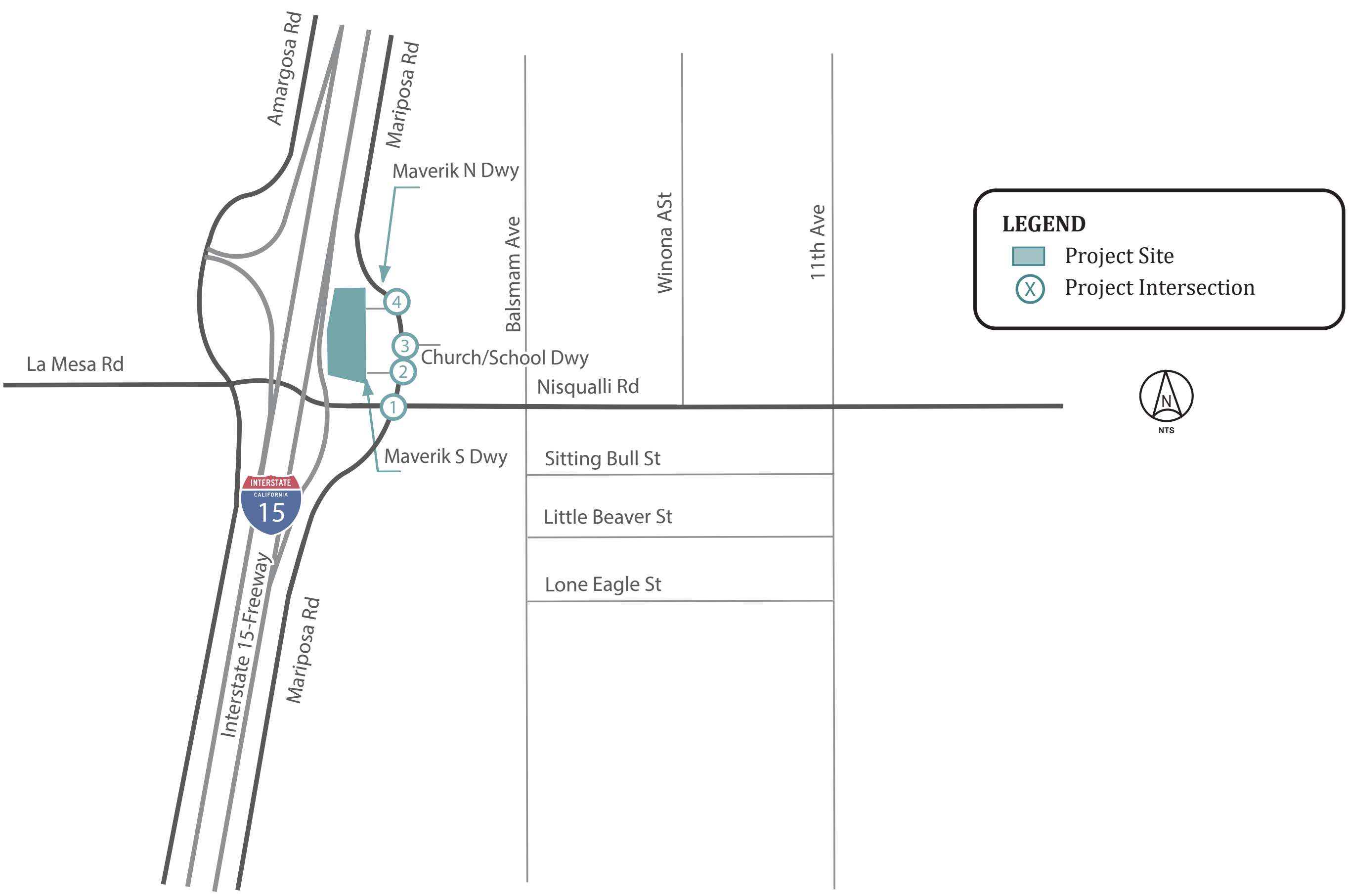
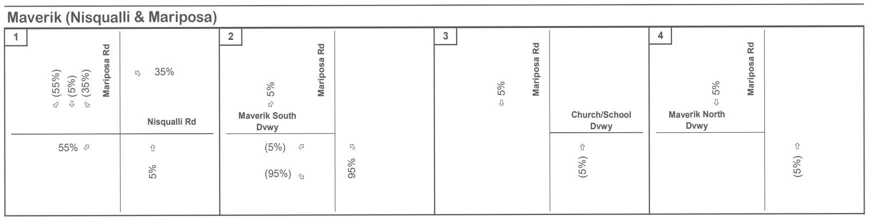


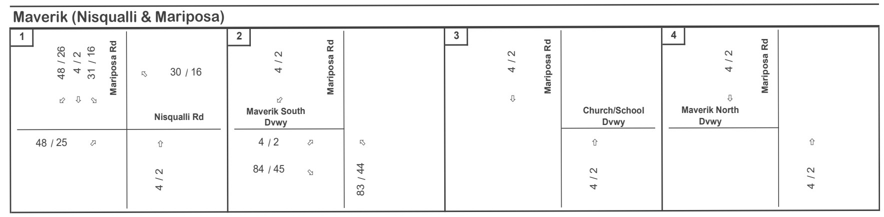
Figure 9 - Passenger Car Trip Distribution and Assignment



Passenger Cars - Primary Trip Distribution

Legend
X% / (Y%) = IN / OUT PERCENT DISTRIBUTION

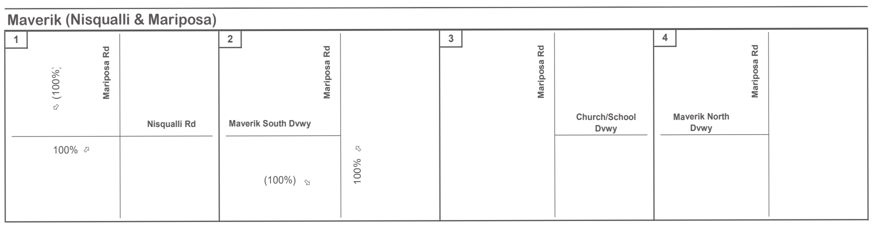
NOT TO SCALE



Passenger Cars - Primary Assignment

Legend
X / Y = AM / PM PEAK HOUR TURNING VOLUMES

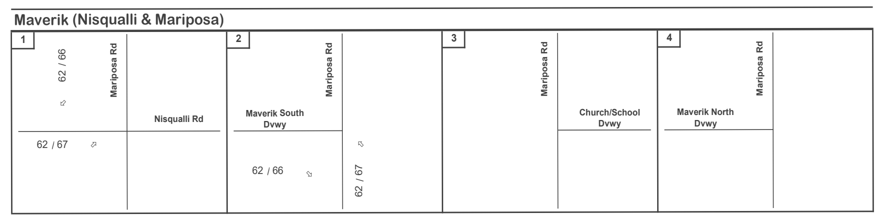
NOT TO SCALE



Passenger Cars - Diverted Trip Distribution

Legend
X% / (Y%) = IN / OUT PERCENT DISTRIBUTION

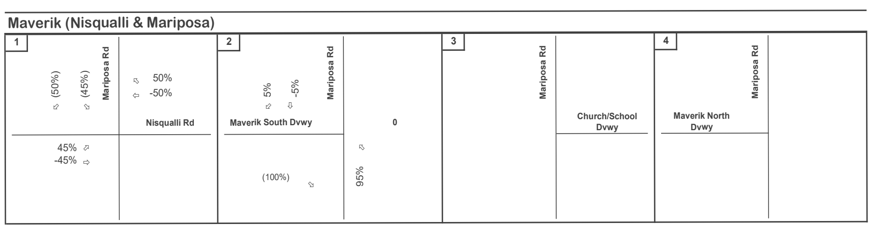
NOT TO SCALE



Passenger Cars - Diverted Assignment

Legend
X / Y = AM / PM PEAK HOUR TURNING VOLUMES

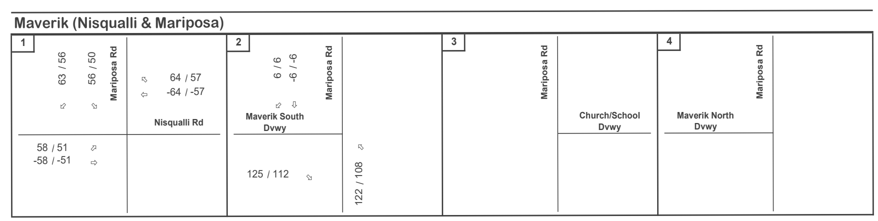
NOT TO SCALE



Passenger Cars - Pass-By Trip Distribution

Legend
X% / (Y%) = IN / OUT PERCENT DISTRIBUTION

NOT TO SCALE

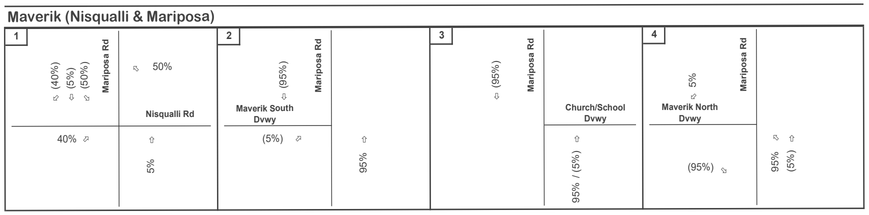


Passenger Cars - Pass-By Assignment

Legend
X / Y = AM / PM PEAK HOUR TURNING VOLUMES

NOT TO SCALE

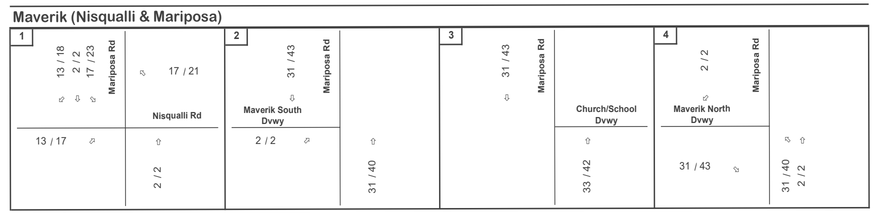
Figure 10 - Truck Trip Distribution and Assignment



Trucks - Primary Trip Distribution

Legend
X% / (Y%) = IN / OUT PERCENT DISTRIBUTION

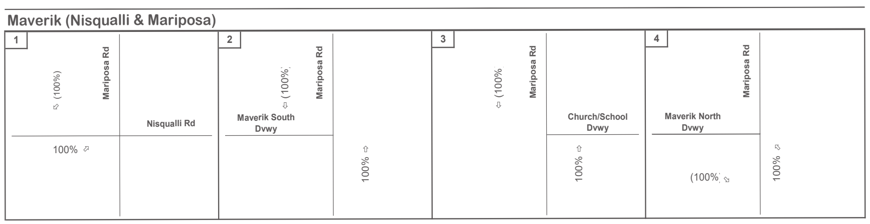
NOT TO SCALE



Trucks - Primary Assignment

Legend
X / Y = AM / PM PEAK HOUR TURNING VOLUMES

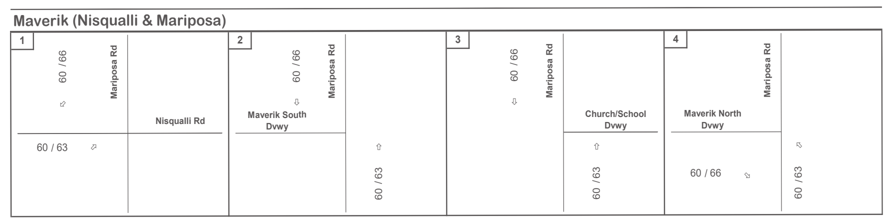
NOT TO SCALE



Trucks - Diverted Trip Distribution

Legend
X% / (Y%) = IN / OUT PERCENT DISTRIBUTION

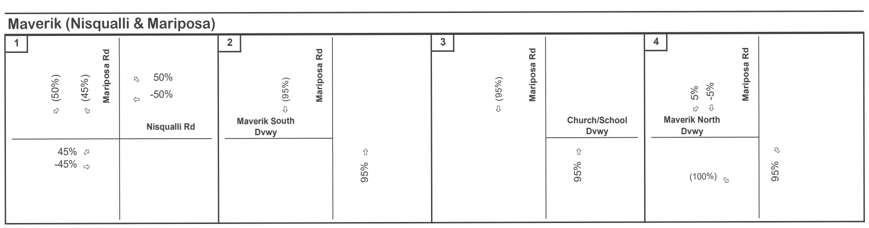
NOT TO SCALE



Trucks - Diverted Assignment

Legend
X / Y = AM / PM PEAK HOUR TURNING VOLUMES

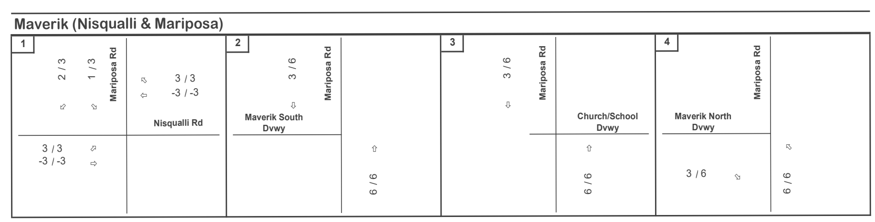
NOT TO SCALE



Trucks - Pass-By Trip Distribution

Legend
X% / (Y%) = IN / OUT PERCENT DISTRIBUTION

NOT TO SCALE

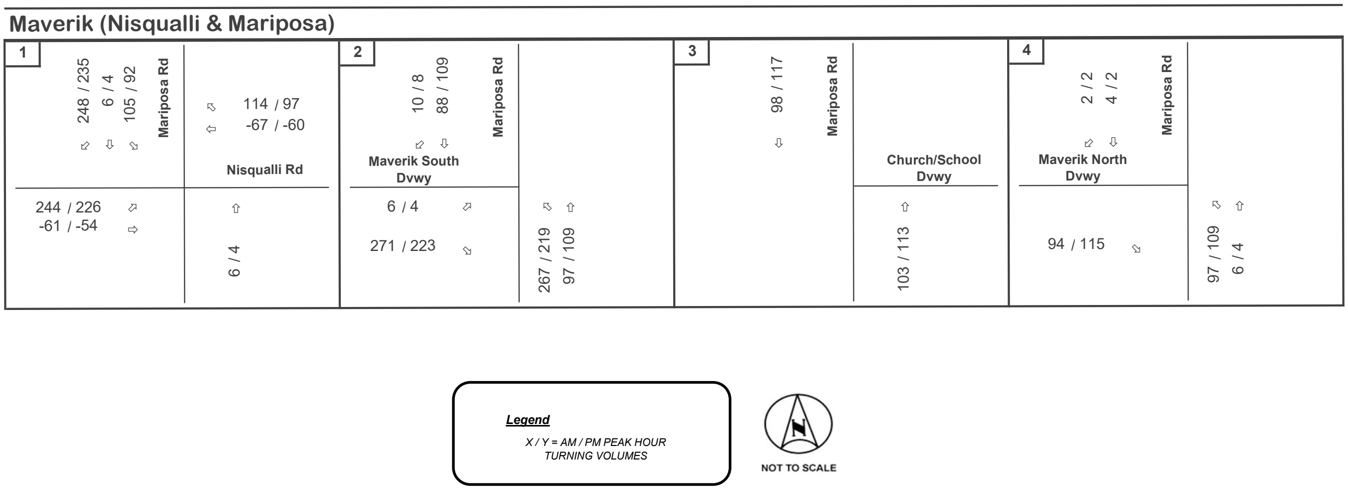


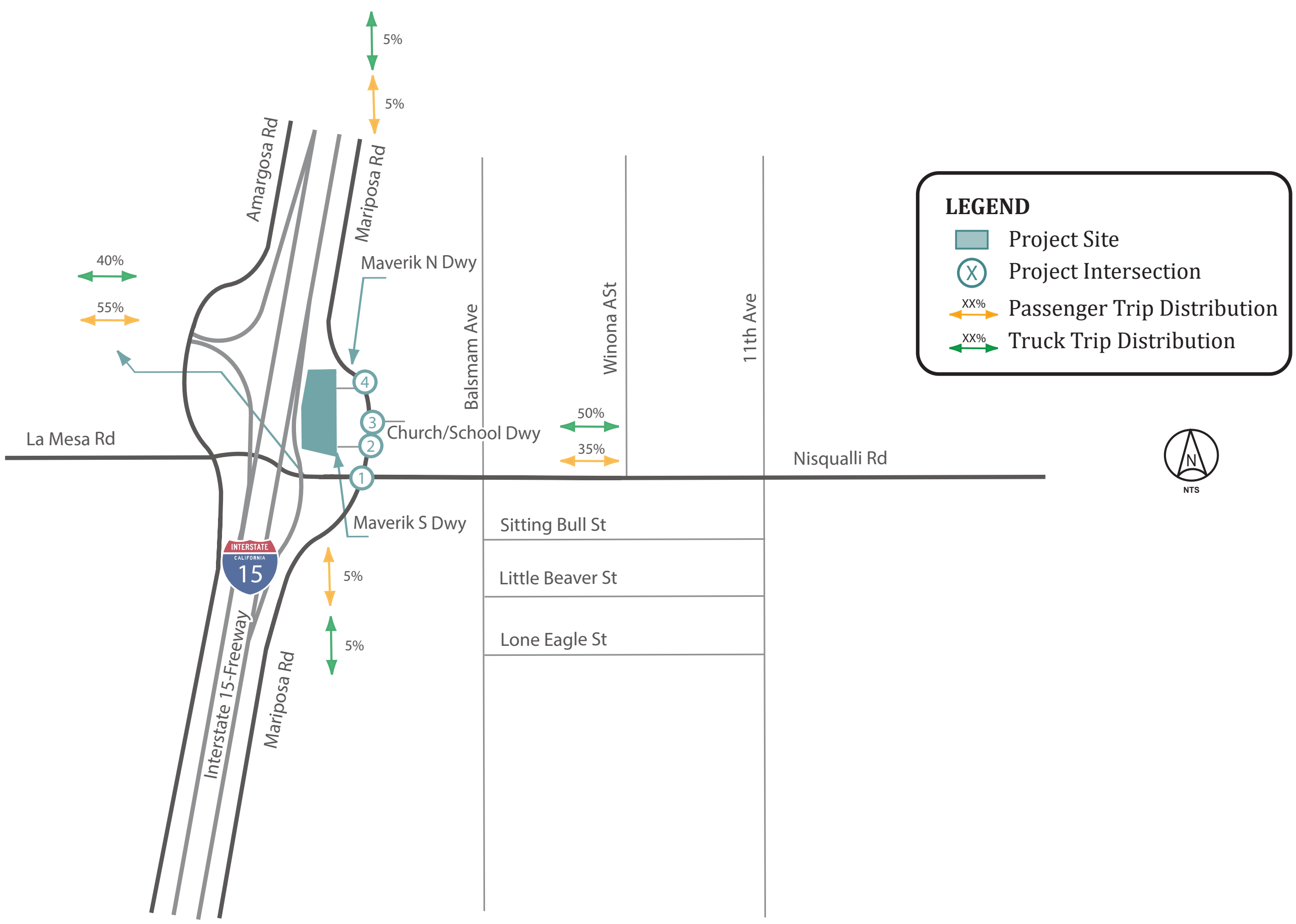
Trucks - Pass-By Assignment

Legend
X / Y = AM / PM PEAK HOUR TURNING VOLUMES

NOT TO SCALE

FIGURE 11 - Total Trip Distribution and Assignment





OPENING YEAR (2023) WITH PROJECT

Project-related traffic for the Maverik project was added to the Opening Year Plus Other Projects traffic volumes, and the resulting “Plus Project” traffic volumes are shown on **Figure 12**.

PEAK HOUR OPERATING CONDITIONS

Intersection Level of Service analysis was conducted for the Opening Year Plus Other Projects Plus Project condition. The results are shown on **Table 10**. Copies of the intersection analysis worksheets are provided in ***Appendix C***.

Table 10: Opening Year Plus Project Peak-Hour Level of Service Summary

Intersection		Peak Hour	Opening Year		Opening Year Plus Project		∆ (c)
			Delay (a)	LOS (b)	Delay (a)	LOS (b)	
1	Mariposa Rd & Nisqualli Rd	AM	14.8	B	23.8	C	9.0
		PM	25.8	C	49.0	D	23.2
2	Mariposa Rd & Maverik South Driveway	AM	-	-	11.5	B	-
		PM	-	-	12.9	B	-
3	Mariposa Rd & Church/School Driveway	AM	9.6	A	10.2	B	0.6
		PM	11.1	B	12.0	B	0.9
4	Mariposa Rd & Maverik North Driveway	AM	-	-	9.4	A	-
		PM	-	-	10.6	B	-

Notes:

(a) Delay refers to the average control delay for the entire intersection, measured in seconds per vehicle. At a two-way stop-controlled intersection, delay refers to the worst movement.

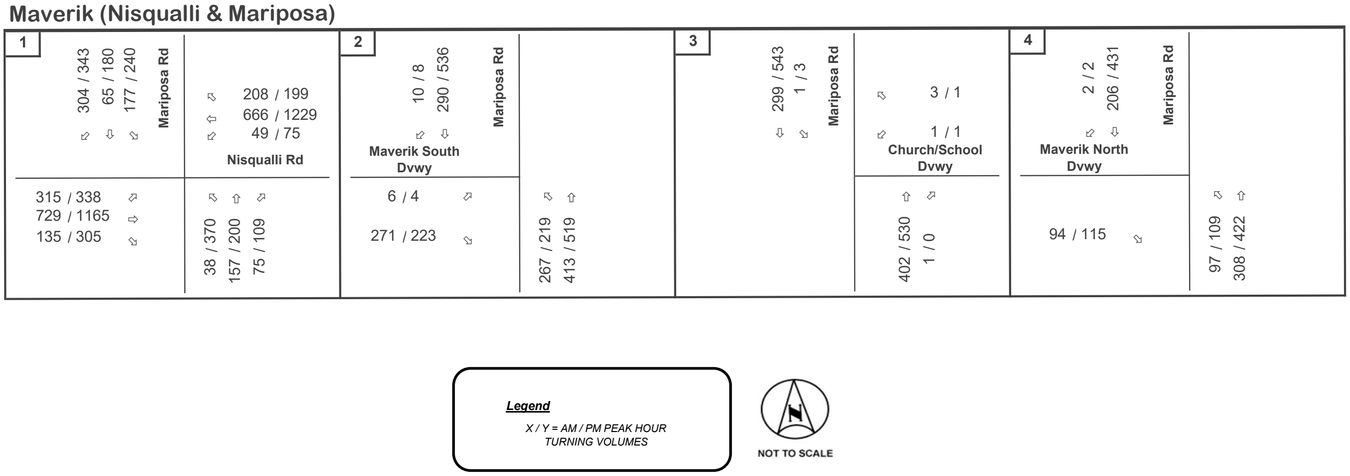
(b) LOS calculations are based on the methodology outlined in the *Highway Capacity Manual 6th* and performed using Synchro 10

(c) Change in delay due to addition of project traffic

Review of Table 10 indicates that, with the addition of project traffic, all intersections would continue to operate at an acceptable Level of Service.

FIGURE 12 - Opening Year Plus Project Volumes

Maverik (Nisqualli & Mariposa)



FUTURE YEAR (2031) CONDITIONS

Based on coordination with City of Victorville staff, an ambient growth rate of 2% was applied to Existing Conditions traffic counts to obtain Future Year volumes. Future Year 2031 traffic volumes at the study intersections are shown on **Figure 13.**

PEAK HOUR OPERATING CONDITIONS

Intersection Level of Service analysis was conducted for the Future Year 2031 Conditions, and the results are shown on **Table 11**. Copies of intersection analysis worksheets are provided in ***Appendix C***.

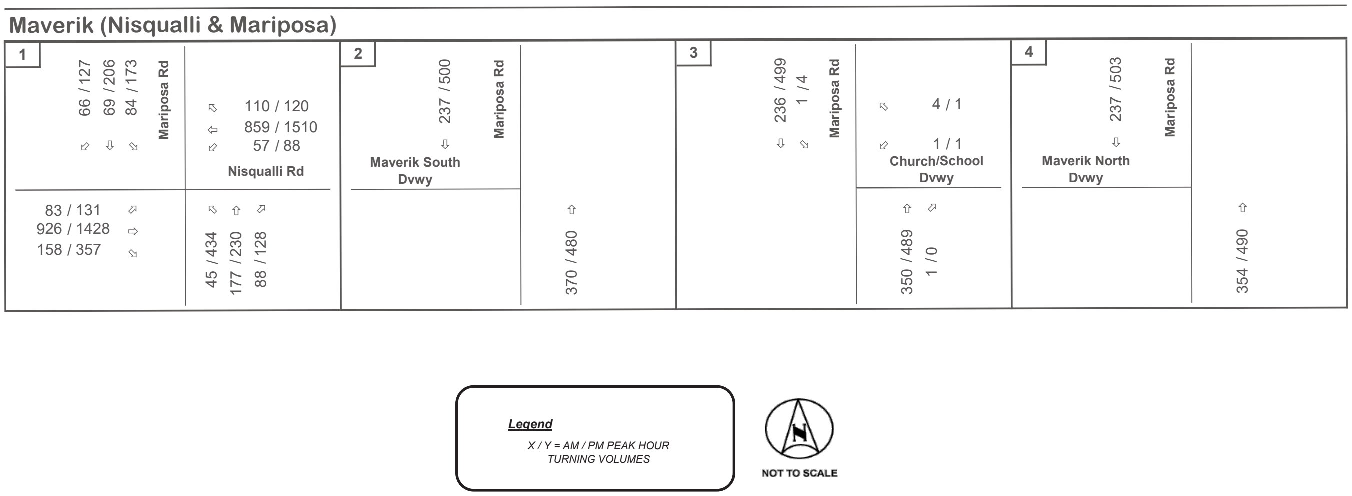
Table 11: Future Year Peak-Hour Level of Service Summary

Intersection		Traffic Control	Peak Hour	Future Year	
				Delay (a)	LOS (b)
1	Mariposa Rd & Nisqualli Rd	Signal	AM	15.6	B
			PM	32.8	C
3	Mariposa Rd & Church/School Driveway	One-Way Stop	AM	9.8	A
			PM	11.7	B

Notes
(a) Delay refers to the average control delay for the entire intersection, measured in seconds per vehicle. At a two-way stop-controlled intersection, delay refers to the worst movement.
(b) LOS calculations are based on the methodology outlined in the *Highway Capacity Manual* 6th Edition and performed using Synchro 10

Review of this table indicates that, under Future Year 2031 conditions, all study intersections would operate at an acceptable Level of Service.

FIGURE 13 - Future Year Volumes



FUTURE YEAR (2031) WITH PROJECT

Project-related traffic was added to the Future Year 2031 traffic volumes. Future Year 2031 Plus Project traffic volumes at the study intersections and the roadway segments are shown on **Figure 14**.

PEAK HOUR OPERATING CONDITIONS

Intersection Level of Service analysis was conducted for the Future Year 2031 Plus Project condition. The results are shown on **Table 12**. Copies of intersection analysis worksheets are provided in ***Appendix C***.

Table 12: Future Year Plus Project Peak-Hour Level of Service Summary

Intersection		Peak Hour	Future Year		Future Year Plus Project		Δ (c)
			Delay (a)	LOS (b)	Delay (a)	LOS (b)	
1	Mariposa Rd & Nisqualli Rd	AM	15.6	B	24.4	C	8.8
		PM	32.8	C	54.4	D	21.6
2	Mariposa Rd & Maverik South Driveway	AM	-	-	11.9	B	-
		PM	-	-	13.8	B	-
3	Mariposa Rd & Church/School Driveway	AM	9.8	A	10.4	B	0.6
		PM	11.7	B	12.7	B	1.0
4	Mariposa Rd & Maverik North Driveway	AM	-	-	9.6	A	-
		PM	-	-	11.0	B	-

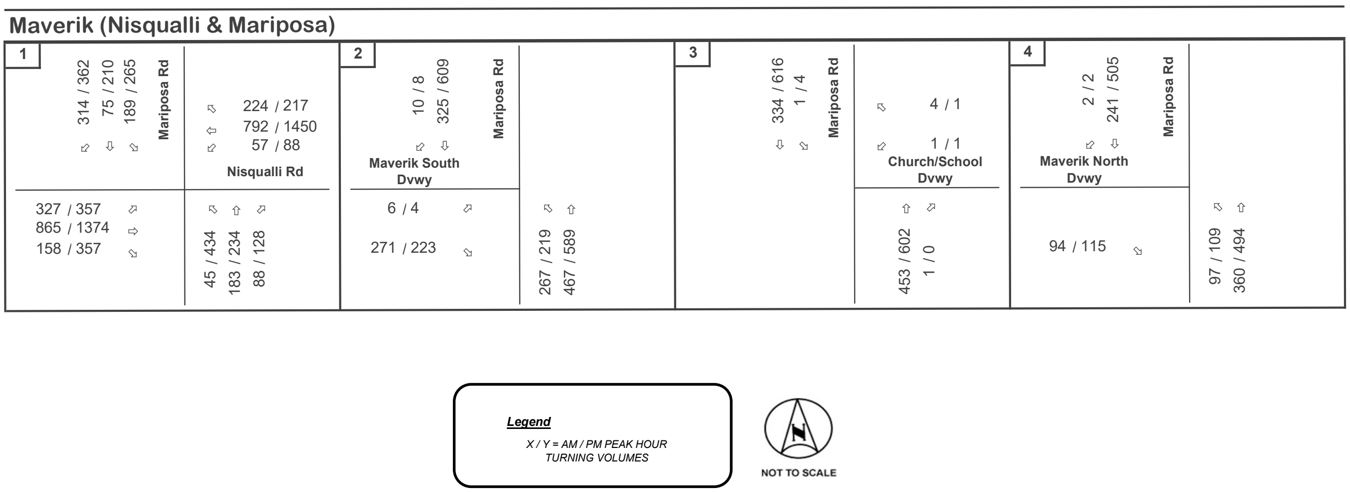
Notes:

(a) Delay refers to the average control delay for the entire intersection, measured in seconds per vehicle. At a two-way stop-controlled intersection, delay refers to the worst movement.

(b) LOS calculations are based on the methodology outlined in the *Highway Capacity Manual 6th* and performed using Synchro 10
(c) Change in delay due to addition of project traffic

Review of this table indicates that, with the addition of Project traffic, all intersections would operate at an acceptable Level of Service.

FIGURE 14 - Future Year Plus Project Volumes



IMPROVEMENTS

As all study intersections were found to continue to operate at acceptable level of service with the addition of project trips in all study scenarios, no improvements are recommended based on this study.

SITE ACCESS AND CIRCULATION

The project site plan presented on **Figure 2** (previously referenced) indicates that vehicular access provisions for the project site would consist of two driveways, both located on Mariposa Road.

- Maverik North Driveway – Three-quarter access driveway with full inbound access and right-out only access for trucks only.
- Maverik South Driveway – Full-movement driveway for passenger cars and left-turn out access allowed for trucks.

The proposed striping changes along Mariposa Road due to the project are listed below:

- Maverik North Driveway
    - Adding a 120' northbound left-turn pocket into the driveway with a 50' opening
    - Shifting southbound turn pocket laterally to the west into school/church driveway to accommodate new northbound left-turn pocket
- Maverik South Driveway
    - Adding a 100' northbound left-turn pocket into the driveway with a 50' opening

The project will provide a total of 42 passenger car parking stalls, 24 passenger car fuel pumps, and 9 truck fueling stations.

QUEUING ANALYSIS

95th Percentile queueing analysis was performed under Opening Year (2023) With Project and Future Year (2031) With Project conditions using SimTraffic software for vehicles entering the site from northbound Mariposa Road and vehicles making a southbound left-turn at Mariposa Road and Nasqualli Road. Proposed and existing left-turn storage lengths and projected queues are shown in **Table 13**.

Table 13: Driveway Queuing Analysis

#	Intersection	Movement	Total Storage Length per Lane (ft)	Peak Hour	Project Added Traffic	95th Percentile Queue Length (ft) (a)	
						Opening Year (2023) with Project	Future Year (2031) with Project
1	Mariposa Road & Nisqualli Road	SBL	210	AM	105	129	138
				PM	92	156	189
2	Maverik South Driveway	NBL	100	AM	267	129	115
				PM	219	123	129
4	Maverik North Driveway	NBL	120	AM	97	44	48
				PM	109	58	64

Notes:

(a) 95th Percentile Queues calculated using SimTraffic software.

As shown in **Table 13**, the proposed turn pockets are found to provide adequate storage length for AM and PM peak hour queues. **Appendix D** contains the project driveway queue analysis worksheets from SimTraffic.

FINDINGS AND CONCLUSIONS

- The proposed project site is a vacant 6.02 acre lot located at the northwest corner of Nisqualli Road and Mariposa Road, just east of Interstate-15. The project is a 2,981 square-foot quick serve restaurant, a 6,103 square-foot convenience store with gas pumps, and a truck stop with 9 fueling stations. The project proposes two unsignalized site access driveways along Mariposa Road which will provide access for vehicles traveling northbound and southbound along Mariposa Road.
- Based on the screening criteria outlined in the City of Victorville Vehicle Miles Traveled (VMT) Analysis Guidelines (Resolution No. 20-031), retail land uses under 122,000 square feet are screened out of VMT analysis, therefore the project is screened out of VMT analysis using the project's land use type.
- This study has found no operational deficiencies as a result of this project. All study intersections in all scenarios are projected to operate at an acceptable level of service in accordance with to City of Victorville guidelines.

APPENDIX A – Approved Project Scoping Letter

MEMORANDUM

To:	Anwar Wagdy, PE City of Victorville
From:	Leo Espelet, PE, TE Kimley-Horn and Associates, Inc.
Date:	February 16, 2021
Subject:	Maverik (Nisqualli & Mariposa) Transportation Study Scoping

This memorandum presents our proposed Transportation Study Scoping prepared for the Maverik (the project) site located on the northwest corner of the Nisqualli Road and Mariposa Road intersection.

The project will evaluate transportation impacts under the California Environmental Quality Act (CEQA) using a Vehicle Miles Traveled (VMT) metric, pursuant to direction from the Governor's Office of Planning and Research (OPR) in December 2018 (Technical Advisory on Evaluating Impacts in CEQA). Based on coordination with the City of Victorville staff, a local access study, based on LOS will also be performed for the adjacent signalized intersection and project driveways. This evaluation will adhere to the City's *General Guidelines for Conducting Traffic Studies and Determination of Intersection Level of Service and Improvement Needs* from 2005.

PROJECT DESCRIPTION

The proposed project would construct a 5,951 square-foot convenience store with gas pumps, and a truck stop with 9 fueling stations on a currently unoccupied site.

The proposed site plan is presented in **Figure 1**.

STUDY AREA

Based on coordination with City of Victorville staff, the study area would consist of 1 signalized intersection and 3 unsignalized intersections, 2 of which would contain the proposed site driveways. The study area is illustrated in **Figure 2**.

1. Nisqualli Road and Mariposa Road (Signalized)
2. Mariposa Road and Site Driveway (Unsignalized – proposed – full access)
3. Mariposa Road and School Driveway (Unsignalized – existing)
4. Mariposa Road and Site Driveway (Unsignalized – proposed – partial access)

TRIP GENERATION

The Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition was referenced to estimate the trip generation for the proposed project. The "Super

Convenience Market/Gas Station" (ITE Code 960) land use was used to forecast daily and peak-hour trips for the convenience store portion of the project. The "Truck Stop" (Code 950) land use was used to forecast peak-hour trips for the truck stop portion of the site per fueling position. The daily trips for the truck stop portion of the site were calculated based on data collected from similar operating sites within the region. **Table 1** summarizes the trip rates that were used to develop the anticipated trip generation for the site.

Pass-by trip rates and diverted trip rates were applied to the site according to the ITE Trip Generation Manual and adjusted on coordination with City of Victorville staff. No transit, bicycle or pedestrian credits were applied, and no internal capture credits were applied. **Table 2** summarizes the net primary trips for the convenience store portion of the site after applying pass-by and diverted trip rates.

A Passenger Car Equivalent (PCE) factor was also applied to the truck trips. The PCE was assumed to be 3.0 for trucks accessing the site. **Table 3** summarizes the net primary trips in PCE after applying the pass-by and diverted trip rates for the truck stop portion of the site.

Table 4 summarizes the total cumulative and driveway trip generation for the entire project site. As shown, the project is expected to generate a total of 3,306 daily trips with 234 morning peak-hour trips (117 in, 117 out) and 165 afternoon peak-hour trips (81 in, 84 out).

Table 1 - Trip Generation Rates

Land Use	Source	Units	Daily Trip Rate	AM Peak Hour Rate		PM Peak Hour Rate	
				Trip Rate	In : Out	Trip Rate	In : Out
Super Convenience Market/Gas Station	ITE Code 960	5.951 KSF	837.58	83.14	50% : 50%	69.28	50% : 50%
Truck Stop	Data (a)/ITE Code 950	9 Truck FP	88.89	7.18	51% : 49%	8.41	49% : 51%

Notes
KSF = 1000 sf
AM and/or PM rates correspond to peak of adjacent street traffic
Trip Generation data for ITE Codes from *ITE Trip Generation, 10th Edition*
(a) Daily trip rates developed based on data from similar sites within the region. Peak hour trip rates based on ITE.

Table 2 - Project Passenger Car Trip Generation

Proposed Land Use (a)	Units	Daily Trips	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Super Convenience Market/Gas Station (b)	5.951 KSF	4,984	248	247	495	206	206	412
Internal Capture (c) 0%		*0*	*0*	*0*	*0*	*0*	*0*	*0*
Net Driveway Trips – Gas Station with Convenience Market		4,984	248	247	495	206	206	412
Pass-By Trips (d) (Daily: 25%, AM: 45%, PM: 50%)		*-1,246*	*-112*	*-111*	*-223*	*-103*	*-103*	*-206*
Diverted Trips (e) (Daily: 26%, AM: 21%, PM: 31%)		*-1,296*	*-52*	*-52*	*-104*	*-64*	*-64*	*-128*
Net Primary Trips – Super Convenience Market/Gas Station		***2,442***	***84***	***84***	***168***	***39***	***39***	***78***

Notes
(a) Passenger Car trips include trips to 5.951 ksf Super Convenience Market/Gas Station.
(b) Trip Generation data from ITE Trip Generation Manual, 10th Edition
(c) Internal capture rates from ITE Trip Generation Handbook, 3rd Edition NCHRP 684 Interna Trip Capture Estimation Tool
(d) Pass-by rates from ITE Trip Generation Handbook, 3rd Edition for LU 945 Gasoline/Service Station With Convenience Market
(e) Diverted trip rates from ITE Trip Generation Handbook, 3rd Edition for ITE LU 945 Gasoline/Service Station With Convenience

Table 3 - Truck Trip Generation

Proposed Land Use	Units	Daily Trips (a)	AM Peak Hour (b)			PM Peak Hour (b)		
			In	Out	Total	In	Out	Total
Truck Stop	9 Fueling Positions	800	33	32	65	37	39	76
Internal Capture (c) 0%		*0*	*0*	*0*	*0*	*0*	*0*	*0*
Net Driveway Trips – Truck Stop		800	33	32	65	37	39	76
Net Driveway Trips in PCE (PCE=3.0)		2,400	99	96	195	111	117	228
Pass-By Trips (d) (Daily: 5%, AM: 5%, PM: 5%)		*-40*	*-2*	*-1*	*-3*	*-2*	*-2*	*-4*
Diverted Trips (e) (Daily: 59%, AM: 62%, PM: 56%)		*-472*	*-20*	*-20*	*-40*	*-21*	*-22*	*-43*
Net Primary Trips – Truck Stop		***288***	***11***	***11***	***22***	***14***	***15***	***29***
Net Primary Trips in PCE (PCE=3.0)		***864***	***33***	***33***	***66***	***42***	***45***	***87***

Notes
(a) Truck trips include trips to the Truck Stop land use portion only, using daily trip information obtained from similar faclilities
(b) Peak hour information estimated using peak hour percentages from ITE Trip Generation Manual, 10th Edition
(c) No internal capture was assumed for the Truck Stop land use, as a truck stop is assumed to include a variety of services
(d) As there was no supporting data available to define the number of pass-by trips, pass-by rates were estimated to be 5%
(e) As there was no supporting data available to define the number of pass-by trips, diverted rates were estimated to be similar to a Super Convenience Market with Gas Station

Table 4 - Total Project Trip Generation

	Daily Trips	AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total
Total Primary Trips							
Super Convenience Market/Gas Station	2,442	84	84	168	39	39	78
Truck Stop (PCE = 3.0)	864	33	33	66	42	45	87
Total Primary Trip Generation	**3,306**	**117**	**117**	**234**	**81**	**84**	**165**
Total Driveway Trips							
Super Convenience Market/Gas Station	4,984	248	247	495	206	206	412
Truck Stop (PCE = 3.0)	2,400	99	96	195	111	117	228
Total Driveway Trip Generation	**7,384**	**347**	**343**	**690**	**317**	**323**	**640**

TRIP DISTRIBUTION

The project traffic distribution was estimated based on the project access locations, freeway access, and roadway network within the study area, and coordination with City of Victorville staff.

The trip distributions are presented in **Figure 2**.

ANALYSIS SCENARIOS

As part of the proposed project, the traffic study would analyze the following scenarios:

- Existing (2021) Conditions
- Opening Year (2023) Conditions
- Opening Year plus Project Conditions
- Future Year (2031) Conditions
- Future Year plus Project Conditions

The City has also requested a queue analysis for the northbound direction of Mariposa Road for vehicles entering the site to ensure that the project traffic does not impact through traffic on Mariposa Road.

TRAFFIC VOLUMES

The Opening Year baseline conditions will incorporate any cumulative projects within a 1-mile radius of the site that are provided by the City of Victorville planning department upon request. The Future Year baseline conditions will assume a 2% per year growth rate as recommended by City of Victorville staff.

Existing peak hour turning movement counts will be obtained this month (February 2021) at the two study area intersections. A 24-hour classification count will also be performed on Mariposa Road just north of Nisqualli Road. This will be compared against a historic count provided by the City of Victorville at the same location to determine impacts of the COVID-19 pandemic on the surrounding roadway network. If it is determined that the COVID-19 pandemic has impacted the traffic patterns, a COVID-19 adjustment factor will be developed and applied to the intersection turning movement counts to reflect typical conditions outside of the pandemic.

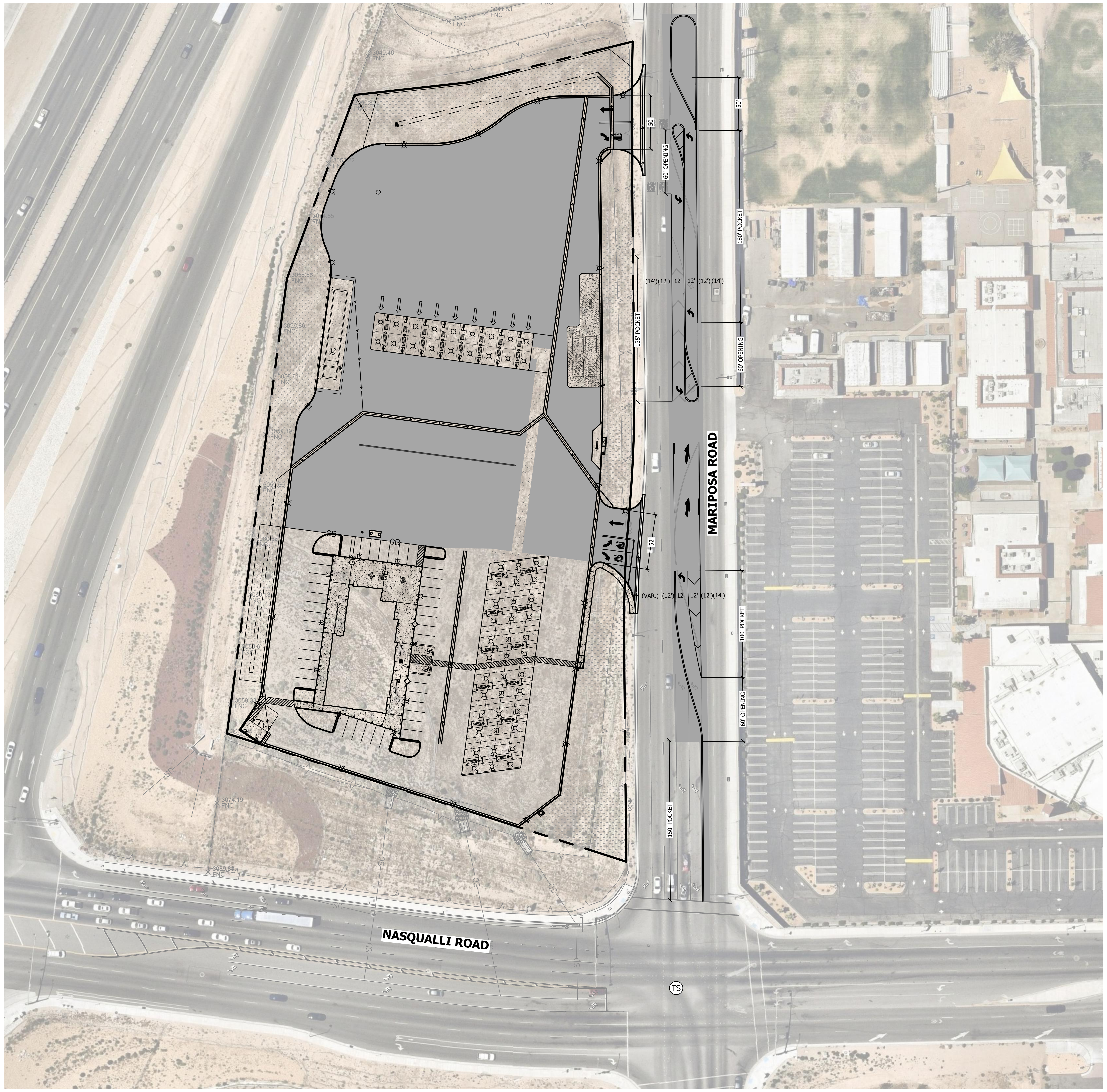
VEHICLE MILES TRAVELED (VMT) ANALYSIS

Based on the screening criteria outlined in the City of Victorville Vehicle Miles Traveled (VMT) Analysis Guidelines (Resolution No. 20-031), retail land uses under 122,000 square feet are screened out of VMT analysis. Therefore, the project would be screened out of VMT analysis using the project's land use type.

FIGURES

- **Figure 1** – Site Plan and Internal Circulation
- **Figure 2** – Transportation Study Area and Trip Distribution

C:\SUBDRIVES\KDRIVE\RIV_LDEV\MAVERIK\195274001 - VICTORVILLE NISQUALLI\CAD\EXHIBITS\2021.02.10 - TIA EXHIBIT\2021.02.10 - TIA OFF-SITE STRIPING EXHIBIT.DWG 2/12/2021 2:19 PM ZIPAGAN, MATTHEW



GRAPHIC SCALE IN FEET
0 25 50 100

NORTH

BLDG Number	GP Number	Project Number

Kimley»Horn

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3880 LEMON STREET, STE. 420, RIVERSIDE, CA 92501
PHONE: 951-543-9868

REGISTERED PROFESSIONAL ENGINEER
SHEA-MICHAEL ANTI
RCE NO. 78274
CIVIL
STATE OF CALIFORNIA

Seal

2/12/2021

MAVERIK
STORE #:TBD
MARIPOSA ROAD & NASQUALLI ROAD
VICTORVILLE, CA

MAVERIK

185 SOUTH STATE STREET, SUITE 800
SALT LAKE CITY, UT. 84111

REVISION

No.	DESCRIPTION	DATE	APPROVED

CITY OF VICTORVILLE
CALIFORNIA

CITY CASE NO.

CITY OF VICTORVILLE
ENGINEERING DEPARTMENT

14343 Civic Drive, Victorville, CA 92392 (760) 955-5000

Approved By:

Brian W. Gengler, RCE C44730
City Engineer

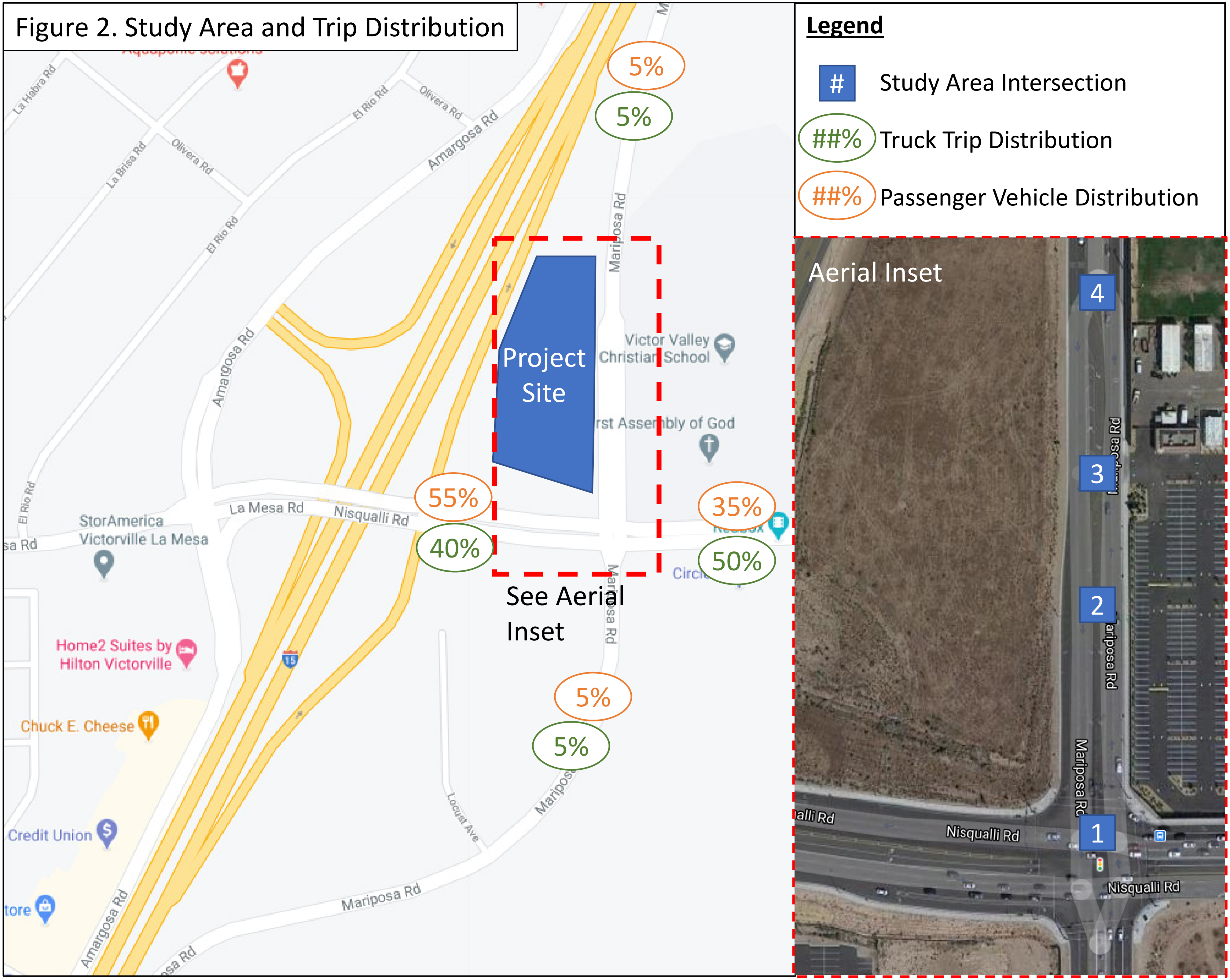
DATE

Sheet Name

Sheet Number

1ST SUBMITTAL 12/18/2020

Figure 2. Study Area and Trip Distribution



APPENDIX B – Traffic Counts

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951)268-6268

City of Victorville
N/S: Mariposa Road
E/W: Nisqualli Road
Weather: Clear

File Name : 01_VIC_Mariposa_Nisqualli AM
Site Code : 10821057
Start Date : 2/10/2021
Page No : 1

Groups Printed- Total Volume

	Mariposa Road Southbound				Nisqualli Road Westbound				Mariposa Road Northbound				Nisqualli 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	7	8	11	26	5	142	15	162	19	15	5	39	7	135	22	164	391
07:15 AM	16	7	8	31	8	172	13	193	21	24	8	53	19	147	24	190	467
07:30 AM	12	10	9	31	15	164	20	199	24	21	13	58	6	194	27	227	515
07:45 AM	26	14	15	55	20	184	31	235	16	41	28	85	13	276	39	328	703
Total	61	39	43	143	48	662	79	789	80	101	54	235	45	752	112	909	2076
08:00 AM	18	14	5	37	10	182	28	220	9	29	14	52	8	160	29	197	506
08:15 AM	16	19	14	49	8	186	20	214	4	41	12	57	10	170	30	210	530
08:30 AM	12	12	11	35	11	180	15	206	7	40	21	68	14	182	36	232	541
08:45 AM	25	30	14	69	7	186	24	217	7	32	18	57	10	196	39	245	588
Total	71	75	44	190	36	734	87	857	27	142	65	234	42	708	134	884	2165
Grand Total	132	114	87	333	84	1396	166	1646	107	243	119	469	87	1460	246	1793	4241
Apprch %	39.6	34.2	26.1		5.1	84.8	10.1		22.8	51.8	25.4		4.9	81.4	13.7		
Total %	3.1	2.7	2.1	7.9	2	32.9	3.9	38.8	2.5	5.7	2.8	11.1	2.1	34.4	5.8	42.3	

	Mariposa Road Southbound				Nisqualli Road Westbound				Mariposa Road Northbound				Nisqualli 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 07:45 AM																	
07:45 AM	**26**	14	**15**	**55**	**20**	184	**31**	**235**	**16**	**41**	**28**	**85**	13	**276**	**39**	**328**	**703**
08:00 AM	18	14	5	37	10	182	28	220	9	29	14	52	8	160	29	197	506
08:15 AM	16	**19**	14	49	8	**186**	20	214	4	41	12	57	10	170	30	210	530
08:30 AM	12	12	11	35	11	180	15	206	7	40	21	68	**14**	182	36	232	541
Total Volume	72	59	45	176	49	732	94	875	36	151	75	262	45	788	134	967	2280
% App. Total	40.9	33.5	25.6		5.6	83.7	10.7		13.7	57.6	28.6		4.7	81.5	13.9		
PHF	.692	.776	.750	.800	.613	.984	.758	.931	.563	.921	.670	.771	.804	.714	.859	.737	.811

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City of Victorville
N/S: Mariposa Road
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File Name : 01_VIC_Mariposa_Nisqualli AM
Site Code : 10821057
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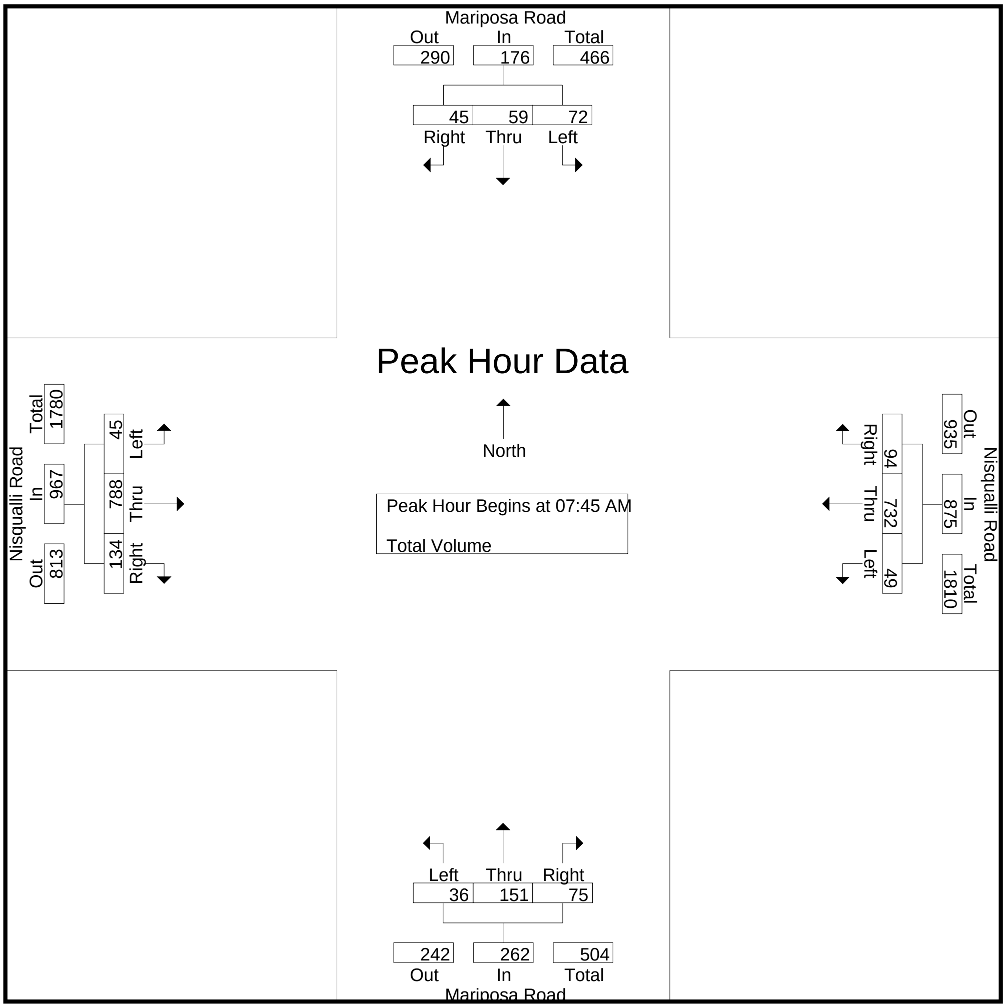
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	08:00 AM				07:45 AM				07:45 AM				07:45 AM			
+0 mins.	18	14	5	37	**20**	184	**31**	**235**	**16**	**41**	**28**	**85**	13	**276**	**39**	**328**
+15 mins.	16	19	**14**	49	10	182	28	220	9	29	14	52	8	160	29	197
+30 mins.	12	12	11	35	8	**186**	20	214	4	41	12	57	10	170	30	210
+45 mins.	**25**	**30**	14	**69**	11	180	15	206	7	40	21	68	**14**	182	36	232
Total Volume	71	75	44	190	49	732	94	875	36	151	75	262	45	788	134	967
% App. Total	37.4	39.5	23.2		5.6	83.7	10.7		13.7	57.6	28.6		4.7	81.5	13.9	
PHF	.710	.625	.786	.688	.613	.984	.758	.931	.563	.921	.670	.771	.804	.714	.859	.737

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PO Box 1178
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City of Victorville
N/S: Mariposa Road
E/W: Nisqualli Road
Weather: Clear

File Name : 01_VIC_Mariposa_Nisqualli PM
Site Code : 10821057
Start Date : 2/10/2021
Page No : 1

Groups Printed- Total Volume

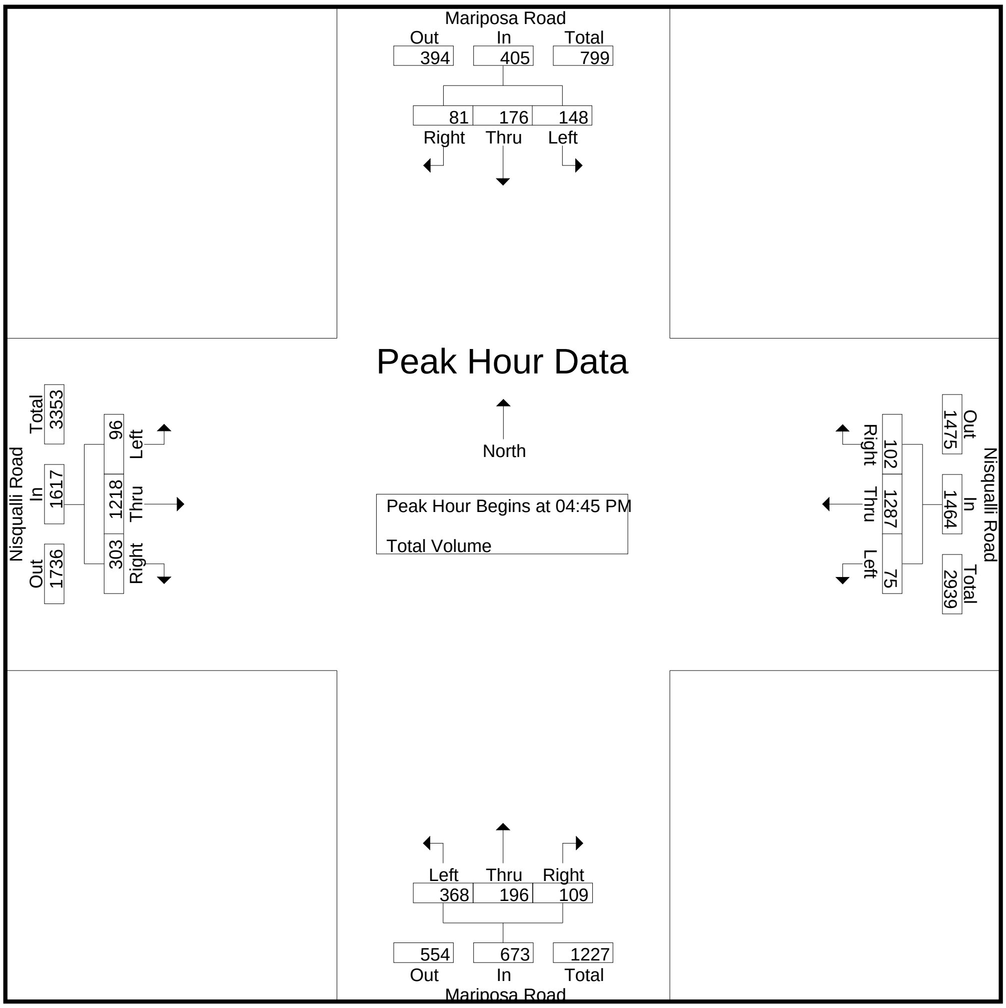
	Mariposa Road Southbound				Nisqualli Road Westbound				Mariposa Road Northbound				Nisqualli Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	41	43	34	118	17	272	19	308	86	48	23	157	23	284	64	371	954
04:15 PM	23	45	27	95	17	301	14	332	80	51	23	154	31	320	57	408	989
04:30 PM	29	41	12	82	24	245	26	295	75	46	28	149	26	312	57	395	921
04:45 PM	29	48	25	102	19	316	21	356	79	54	24	157	25	301	84	410	1025
Total	122	177	98	397	77	1134	80	1291	320	199	98	617	105	1217	262	1584	3889
05:00 PM	41	47	20	108	18	293	32	343	82	34	26	142	26	289	65	380	973
05:15 PM	48	42	20	110	17	380	32	429	115	53	33	201	22	318	76	416	1156
05:30 PM	30	39	16	85	21	298	17	336	92	55	26	173	23	310	78	411	1005
05:45 PM	26	41	29	96	24	274	26	324	78	46	37	161	23	293	60	376	957
Total	145	169	85	399	80	1245	107	1432	367	188	122	677	94	1210	279	1583	4091
Grand Total	267	346	183	796	157	2379	187	2723	687	387	220	1294	199	2427	541	3167	7980
Apprch %	33.5	43.5	23		5.8	87.4	6.9		53.1	29.9	17		6.3	76.6	17.1		
Total %	3.3	4.3	2.3	10	2	29.8	2.3	34.1	8.6	4.8	2.8	16.2	2.5	30.4	6.8	39.7	

	Mariposa Road Southbound				Nisqualli Road Westbound				Mariposa Road Northbound				Nisqualli 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 04:45 PM																	
04:45 PM	29	**48**	**25**	102	19	316	21	356	79	54	24	157	25	301	**84**	410	1025
05:00 PM	41	47	20	108	18	293	**32**	343	82	34	26	142	**26**	289	65	380	973
05:15 PM	**48**	42	20	**110**	17	**380**	32	**429**	**115**	53	**33**	**201**	22	**318**	76	**416**	**1156**
05:30 PM	30	39	16	85	**21**	298	17	336	92	**55**	26	173	23	310	78	411	1005
Total Volume	148	176	81	405	75	1287	102	1464	368	196	109	673	96	1218	303	1617	4159
% App. Total	36.5	43.5	20		5.1	87.9	7		54.7	29.1	16.2		5.9	75.3	18.7		
PHF	.771	.917	.810	.920	.893	.847	.797	.853	.800	.891	.826	.837	.923	.958	.902	.972	.899

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951)268-6268

City of Victorville
N/S: Mariposa Road
E/W: Nisqualli Road
Weather: Clear

File Name : 01_VIC_Mariposa_Nisqualli PM
Site Code : 10821057
Start Date : 2/10/2021
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:

	04:45 PM				04:45 PM				05:00 PM				04:45 PM			
+0 mins.	29	**48**	**25**	102	19	316	21	356	82	34	26	142	25	301	**84**	410
+15 mins.	41	47	20	108	18	293	**32**	343	**115**	53	33	**201**	**26**	289	65	380
+30 mins.	**48**	42	20	**110**	17	**380**	32	**429**	92	**55**	26	173	22	**318**	76	**416**
+45 mins.	30	39	16	85	**21**	298	17	336	78	46	**37**	161	23	310	78	411
Total Volume	148	176	81	405	75	1287	102	1464	367	188	122	677	96	1218	303	1617
% App. Total	36.5	43.5	20		5.1	87.9	7		54.2	27.8	18		5.9	75.3	18.7	
PHF	.771	.917	.810	.920	.893	.847	.797	.853	.798	.855	.824	.842	.923	.958	.902	.972

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City of Victorville
N/S: Mariposa Road
E/W: Victor Valley Christian School DW
Weather: Clear

File Name : 02_VIC_Mariposa_Christian DW AM
Site Code : 10821057
Start Date : 2/10/2021
Page No : 1

Groups Printed- Total Volume

	Mariposa Road Southbound			Victor Valley Christian School Driveway Westbound			Mariposa Road Northbound			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
07:00 AM	0	23	23	0	0	0	43	0	43	66
07:15 AM	0	29	29	0	0	0	50	3	53	82
07:30 AM	1	33	34	0	1	1	47	0	47	82
07:45 AM	3	39	42	3	0	3	74	3	77	122
Total	4	124	128	3	1	4	214	6	220	352
08:00 AM	0	41	41	0	2	2	73	1	74	117
08:15 AM	0	47	47	0	0	0	65	0	65	112
08:30 AM	1	41	42	0	0	0	61	0	61	103
08:45 AM	0	61	61	1	1	2	74	0	74	137
Total	1	190	191	1	3	4	273	1	274	469
Grand Total	5	314	319	4	4	8	487	7	494	821
Apprch %	1.6	98.4		50	50		98.6	1.4		
Total %	0.6	38.2	38.9	0.5	0.5	1	59.3	0.9	60.2	

	Mariposa Road Southbound			Victor Valley Christian School Driveway Westbound			Mariposa Road Northbound			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	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 08:00 AM										
08:00 AM	0	41	41	0	**2**	**2**	73	**1**	**74**	117
08:15 AM	0	47	47	0	0	0	65	0	65	112
08:30 AM	**1**	41	42	0	0	0	61	0	61	103
08:45 AM	0	**61**	**61**	**1**	1	2	**74**	0	74	**137**
Total Volume	1	190	191	1	3	4	273	1	274	469
% App. Total	0.5	99.5		25	75		99.6	0.4		
PHF	.250	.779	.783	.250	.375	.500	.922	.250	.926	.856

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File Name : 02_VIC_Mariposa_Christian DW AM
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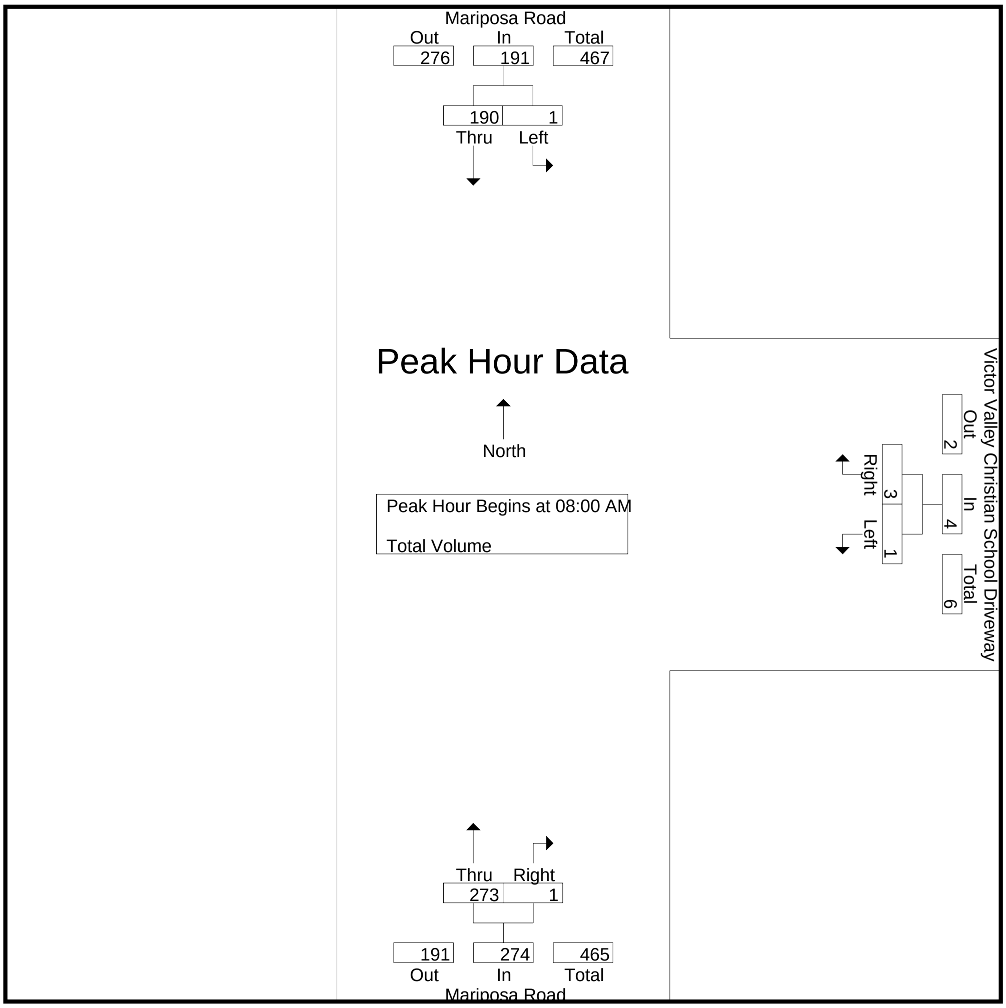

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	08:00 AM			07:15 AM			07:45 AM		
+0 mins.	0	41	41	0	0	0	**74**	**3**	**77**
+15 mins.	0	47	47	0	1	1	73	1	74
+30 mins.	**1**	41	42	**3**	0	**3**	65	0	65
+45 mins.	0	**61**	**61**	0	**2**	2	61	0	61
Total Volume	1	190	191	3	3	6	273	4	277
% App. Total	0.5	99.5		50	50		98.6	1.4	
PHF	.250	.779	.783	.250	.375	.500	.922	.333	.899

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Weather: Clear

File Name : 02_VIC_Mariposa_Christian DW PM
Site Code : 10821057
Start Date : 2/10/2021
Page No : 1

Groups Printed- Total Volume

	Mariposa Road Southbound			Victor Valley Christian School Driveway Westbound			Mariposa Road Northbound			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
04:00 PM	1	120	121	1	4	5	82	0	82	208
04:15 PM	0	98	98	0	2	2	99	0	99	199
04:30 PM	1	81	82	0	0	0	88	1	89	171
04:45 PM	0	93	93	1	0	1	106	0	106	200
Total	2	392	394	2	6	8	375	1	376	778
05:00 PM	3	103	106	0	0	0	93	0	93	199
05:15 PM	0	109	109	0	0	0	107	0	107	216
05:30 PM	0	94	94	0	1	1	95	0	95	190
05:45 PM	5	86	91	1	1	2	100	2	102	195
Total	8	392	400	1	2	3	395	2	397	800
Grand Total	10	784	794	3	8	11	770	3	773	1578
Apprch %	1.3	98.7		27.3	72.7		99.6	0.4		
Total %	0.6	49.7	50.3	0.2	0.5	0.7	48.8	0.2	49	

	Mariposa Road Southbound			Victor Valley Christian School Driveway Westbound			Mariposa Road Northbound			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	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 04:45 PM										
04:45 PM	0	93	93	**1**	0	**1**	106	0	106	200
05:00 PM	**3**	103	106	0	0	0	93	0	93	199
05:15 PM	0	**109**	**109**	0	0	0	**107**	0	**107**	**216**
05:30 PM	0	94	94	0	**1**	1	95	0	95	190
Total Volume	3	399	402	1	1	2	401	0	401	805
% App. Total	0.7	99.3		50	50		100	0		
PHF	.250	.915	.922	.250	.250	.500	.937	.000	.937	.932

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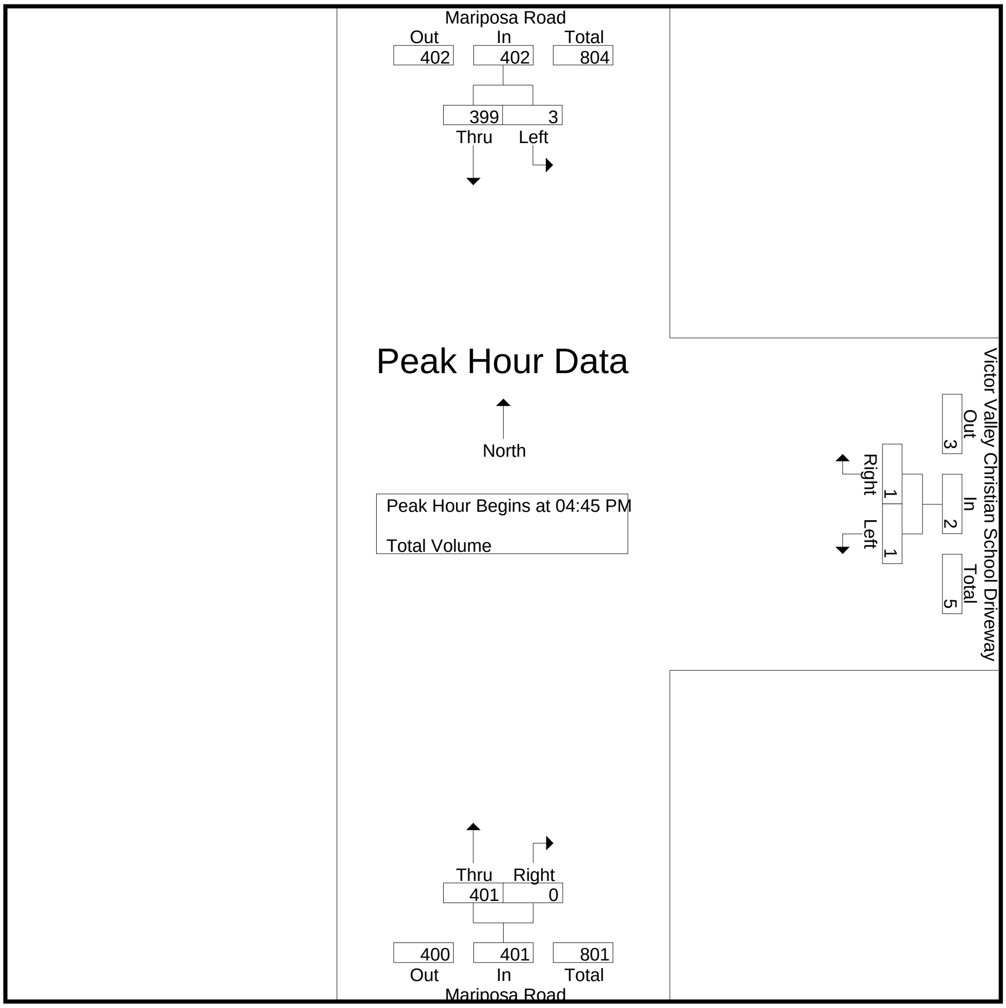

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:45 PM			04:00 PM			04:45 PM		
+0 mins.	0	93	93	**1**	**4**	**5**	106	0	106
+15 mins.	**3**	103	106	0	2	2	93	0	93
+30 mins.	0	**109**	**109**	0	0	0	**107**	0	**107**
+45 mins.	0	94	94	1	0	1	95	0	95
Total Volume	3	399	402	2	6	8	401	0	401
% App. Total	0.7	99.3		25	75		100	0	
PHF	.250	.915	.922	.500	.375	.400	.937	.000	.937

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City of Victorville
Mariposa Road
N/ Nisqualli Road
24 Hour Directional Classification Count

VICMANNI
Site Code: 108-21057

Northbound

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
02/10/21	0	31	5	0	0	0	0	0	0	0	0	0	0	36
01:00	0	16	2	0	0	0	0	0	0	0	0	0	0	18
02:00	0	29	3	0	0	0	0	0	0	0	0	0	0	32
03:00	0	18	10	0	0	0	0	0	0	0	0	0	0	28
04:00	0	31	4	1	1	0	0	0	0	0	0	0	0	37
05:00	0	30	10	1	3	0	0	0	**2**	0	0	0	0	46
06:00	0	99	35	**3**	15	0	0	0	0	0	0	0	0	152
07:00	0	161	47	1	14	0	0	4	1	0	0	0	0	228
08:00	0	189	59	3	**16**	**2**	0	2	2	0	0	0	0	273
09:00	1	228	56	1	11	0	0	3	0	0	0	0	0	300
10:00	**3**	238	70	1	9	1	0	**5**	0	0	0	0	0	327
11:00	2	**289**	**71**	3	14	2	**1**	1	1	**1**	0	0	0	**385**
12 PM	0	299	62	1	12	0	0	**7**	0	0	0	0	0	381
13:00	3	**353**	68	1	16	2	0	7	**1**	**1**	0	0	0	**452**
14:00	4	344	71	1	13	1	0	6	0	0	0	0	0	440
15:00	3	308	66	2	**19**	**3**	0	5	1	0	0	0	0	407
16:00	**5**	300	54	**3**	9	1	**1**	5	1	1	0	0	0	380
17:00	3	285	**78**	2	5	0	1	4	0	1	0	0	0	379
18:00	2	257	59	1	5	0	0	0	0	0	0	0	0	324
19:00	1	181	36	0	5	0	0	0	0	0	0	**1**	0	224
20:00	2	154	17	2	3	0	1	1	0	0	0	0	0	180
21:00	0	91	14	0	1	0	1	0	1	0	0	0	0	108
22:00	0	82	12	1	0	0	0	0	0	0	0	0	0	95
23:00	0	61	13	0	0	0	0	0	0	0	0	0	0	74
Total	29	4074	922	28	171	12	5	50	10	4	0	1	0	5306
Percent	0.5%	76.8%	17.4%	0.5%	3.2%	0.2%	0.1%	0.9%	0.2%	0.1%	0.0%	0.0%	0.0%	
AM Peak	10:00	11:00	11:00	06:00	08:00	08:00	11:00	10:00	05:00	11:00				11:00
Vol.	3	289	71	3	16	2	1	5	2	1				385
PM Peak	16:00	13:00	17:00	16:00	15:00	15:00	16:00	12:00	13:00	13:00		19:00		13:00
Vol.	5	353	78	3	19	3	1	7	1	1		1		452
Grand Total	29	4074	922	28	171	12	5	50	10	4	0	1	0	5306
Percent	0.5%	76.8%	17.4%	0.5%	3.2%	0.2%	0.1%	0.9%	0.2%	0.1%	0.0%	0.0%	0.0%	

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24 Hour Directional Classification Count

VICMANNI
Site Code: 108-21057

Southbound

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
02/10/21	0	35	4	0	2	0	0	0	0	0	0	0	0	41
01:00	0	21	7	0	1	0	0	0	0	0	0	0	0	29
02:00	0	16	2	0	1	0	0	0	0	0	0	0	0	19
03:00	0	19	11	0	1	0	0	0	0	0	0	0	0	31
04:00	0	21	4	1	1	0	0	0	0	0	0	0	0	27
05:00	0	49	12	0	3	0	0	1	**1**	0	0	0	0	66
06:00	0	79	14	2	8	0	0	0	0	0	0	0	0	103
07:00	0	76	41	**3**	12	**2**	0	3	1	0	0	0	0	138
08:00	0	129	46	1	10	1	0	**4**	0	0	0	0	0	191
09:00	0	153	64	3	24	1	0	2	0	0	0	0	0	247
10:00	**1**	170	**69**	1	28	1	0	3	1	0	0	0	0	274
11:00	0	**233**	60	3	**33**	2	0	4	0	0	0	0	0	**335**
12 PM	2	248	84	1	26	1	0	**6**	0	**1**	**1**	0	0	370
13:00	1	255	91	1	22	0	0	5	0	0	0	0	0	375
14:00	1	**276**	75	2	**39**	0	0	3	**1**	0	1	**1**	0	399
15:00	2	268	82	1	33	0	0	5	0	0	0	0	0	391
16:00	2	264	92	2	27	**2**	0	2	0	1	1	0	0	393
17:00	**3**	261	**103**	**3**	26	0	0	4	1	1	0	0	0	**402**
18:00	0	206	70	1	17	1	0	2	0	1	0	0	0	298
19:00	0	123	48	1	16	0	0	0	0	0	0	0	0	188
20:00	0	84	39	1	8	0	0	2	0	0	0	0	0	134
21:00	0	71	25	0	9	0	0	0	0	0	0	0	0	105
22:00	0	53	25	0	5	0	0	0	0	0	0	0	0	83
23:00	1	32	15	1	3	0	0	1	0	0	0	0	0	53
Total	13	3142	1083	28	355	11	0	47	5	4	3	1	0	4692
Percent	0.3%	67.0%	23.1%	0.6%	7.6%	0.2%	0.0%	1.0%	0.1%	0.1%	0.1%	0.0%	0.0%	
AM Peak	10:00	11:00	10:00	07:00	11:00	07:00		08:00	05:00					11:00
Vol.	1	233	69	3	33	2		4	1					335
PM Peak	17:00	14:00	17:00	17:00	14:00	16:00		12:00	14:00	12:00	12:00	14:00		17:00
Vol.	3	276	103	3	39	2		6	1	1	1	1		402
Grand Total	13	3142	1083	28	355	11	0	47	5	4	3	1	0	4692
Percent	0.3%	67.0%	23.1%	0.6%	7.6%	0.2%	0.0%	1.0%	0.1%	0.1%	0.1%	0.0%	0.0%	

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24 Hour Directional Classification Count

VICMANNI
Site Code: 108-21057

Northbound, Southbound

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
02/10/21	0	66	9	0	2	0	0	0	0	0	0	0	0	77
01:00	0	37	9	0	1	0	0	0	0	0	0	0	0	47
02:00	0	45	5	0	1	0	0	0	0	0	0	0	0	51
03:00	0	37	21	0	1	0	0	0	0	0	0	0	0	59
04:00	0	52	8	2	2	0	0	0	0	0	0	0	0	64
05:00	0	79	22	1	6	0	0	1	**3**	0	0	0	0	112
06:00	0	178	49	5	23	0	0	0	0	0	0	0	0	255
07:00	0	237	88	4	26	2	0	7	2	0	0	0	0	366
08:00	0	318	105	4	26	3	0	6	2	0	0	0	0	464
09:00	1	381	120	4	35	1	0	5	0	0	0	0	0	547
10:00	**4**	408	**139**	2	37	2	0	**8**	1	0	0	0	0	601
11:00	2	**522**	131	**6**	**47**	**4**	**1**	5	1	**1**	0	0	0	**720**
12 PM	2	547	146	2	38	1	0	**13**	0	1	**1**	0	0	751
13:00	4	608	159	2	38	2	0	12	**1**	1	0	0	0	827
14:00	5	**620**	146	3	**52**	1	0	9	1	0	1	**1**	0	**839**
15:00	5	576	148	3	52	**3**	0	10	1	0	0	0	0	798
16:00	**7**	564	146	**5**	36	3	**1**	7	1	**2**	1	0	0	773
17:00	6	546	**181**	5	31	0	1	8	1	2	0	0	0	781
18:00	2	463	129	2	22	1	0	2	0	1	0	0	0	622
19:00	1	304	84	1	21	0	0	0	0	0	0	1	0	412
20:00	2	238	56	3	11	0	1	3	0	0	0	0	0	314
21:00	0	162	39	0	10	0	1	0	1	0	0	0	0	213
22:00	0	135	37	1	5	0	0	0	0	0	0	0	0	178
23:00	1	93	28	1	3	0	0	1	0	0	0	0	0	127
Total	42	7216	2005	56	526	23	5	97	15	8	3	2	0	9998
Percent	0.4%	72.2%	20.1%	0.6%	5.3%	0.2%	0.1%	1.0%	0.2%	0.1%	0.0%	0.0%	0.0%	
AM Peak	10:00	11:00	10:00	11:00	11:00	11:00	11:00	10:00	05:00	11:00				11:00
Vol.	4	522	139	6	47	4	1	8	3	1				720
PM Peak	16:00	14:00	17:00	16:00	14:00	15:00	16:00	12:00	13:00	16:00	12:00	14:00		14:00
Vol.	7	620	181	5	52	3	1	13	1	2	1	1		839
Grand Total	42	7216	2005	56	526	23	5	97	15	8	3	2	0	9998
Percent	0.4%	72.2%	20.1%	0.6%	5.3%	0.2%	0.1%	1.0%	0.2%	0.1%	0.0%	0.0%	0.0%	

APPENDIX C – Synchro Analysis Worksheets

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	45	788	134	49	732	94	36	151	75	72	59	45
Future Volume (veh/h)	45	788	134	49	732	94	36	151	75	72	59	45
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1575	1772	1772	1575	1772	1772	1575	1772	1772	1575	1772	1772
Adj Flow Rate, veh/h	61	1065	181	53	787	101	47	196	97	90	74	56
Peak Hour Factor	0.74	0.74	0.74	0.93	0.93	0.93	0.77	0.77	0.77	0.80	0.80	0.80
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	164	1795	557	149	1771	550	138	421	188	203	496	221
Arrive On Green	0.06	0.37	0.37	0.05	0.37	0.37	0.05	0.13	0.13	0.07	0.15	0.15
Sat Flow, veh/h	2910	4837	1502	2910	4837	1502	2910	3367	1502	2910	3367	1502
Grp Volume(v), veh/h	61	1065	181	53	787	101	47	196	97	90	74	56
Grp Sat Flow(s),veh/h/ln	1455	1612	1502	1455	1612	1502	1455	1683	1502	1455	1683	1502
Q Serve(g_s), s	1.1	9.3	4.5	0.9	6.4	2.4	0.8	2.8	3.2	1.6	1.0	1.7
Cycle Q Clear(g_c), s	1.1	9.3	4.5	0.9	6.4	2.4	0.8	2.8	3.2	1.6	1.0	1.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	164	1795	557	149	1771	550	138	421	188	203	496	221
V/C Ratio(X)	0.37	0.59	0.32	0.35	0.44	0.18	0.34	0.47	0.52	0.44	0.15	0.25
Avail Cap(c_a), veh/h	557	3241	1006	557	3241	1006	557	2256	1006	557	1611	719
HCM 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
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.8	13.3	11.8	23.9	12.5	11.3	24.1	21.2	21.4	23.3	19.4	19.7
Incr Delay (d2), s/veh	1.4	0.3	0.3	1.4	0.2	0.2	1.5	0.8	2.2	1.5	0.1	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	2.6	1.1	0.3	1.8	0.6	0.3	1.0	1.0	0.5	0.3	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.2	13.6	12.1	25.4	12.7	11.4	25.6	22.0	23.6	24.8	19.5	20.3
LnGrp LOS	C	B	B	C	B	B	C	C	C	C	B	C
Approach Vol, veh/h		1307			941			340			220	
Approach Delay, s/veh		13.9			13.3			23.0			21.9	
Approach LOS		B			B			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.7	24.4	8.6	11.5	7.9	24.1	7.5	12.7
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	35.0	10.0	35.0	10.0	35.0	10.0	25.0
Max Q Clear Time (g_c+I1), s	2.9	11.3	3.6	5.2	3.1	8.4	2.8	3.7
Green Ext Time (p_c), s	0.0	8.1	0.1	1.4	0.1	5.7	0.0	0.5

Intersection Summary			
HCM 6th Ctrl Delay			15.4
HCM 6th LOS			B

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	290	191	0
Future Vol, veh/h	0	0	0	290	191	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	315	208	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	366	104	208	0	-	0
Stage 1	208	-	-	-	-	-
Stage 2	158	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	607	931	1360	-	-	-
Stage 1	807	-	-	-	-	-
Stage 2	854	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	607	931	1360	-	-	-
Mov Cap-2 Maneuver	655	-	-	-	-	-
Stage 1	807	-	-	-	-	-
Stage 2	854	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1360	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-	-
HCM Control Delay (s)	0	-	0	0	-	-
HCM Lane LOS	A	-	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	3	273	1	1	190
Future Vol, veh/h	1	3	273	1	1	190
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	50	50	93	93	78	78
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	6	294	1	1	244

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	419	148	0	0	295	0
Stage 1	295	-	-	-	-	-
Stage 2	124	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	562	872	-	-	1263	-
Stage 1	730	-	-	-	-	-
Stage 2	888	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	561	872	-	-	1263	-
Mov Cap-2 Maneuver	614	-	-	-	-	-
Stage 1	730	-	-	-	-	-
Stage 2	887	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.6	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	614	872	1263	-
HCM Lane V/C Ratio	-	-	0.003	0.007	0.001	-
HCM Control Delay (s)	-	-	10.9	9.2	7.9	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	0	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	276	191	0
Future Vol, veh/h	0	0	0	276	191	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	180	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	300	208	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	104	208	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	0	931	1360	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	931	1360	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1360	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	0	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	96	1218	303	75	1287	102	368	196	109	148	176	81
Future Volume (veh/h)	96	1218	303	75	1287	102	368	196	109	148	176	81
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1575	1772	1772	1575	1772	1772	1575	1772	1772	1575	1772	1772
Adj Flow Rate, veh/h	99	1256	312	88	1514	120	438	233	130	161	191	88
Peak Hour Factor	0.97	0.97	0.97	0.85	0.85	0.85	0.84	0.84	0.84	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	176	2020	627	169	2008	623	409	547	244	235	345	154
Arrive On Green	0.06	0.42	0.42	0.06	0.42	0.42	0.14	0.16	0.16	0.08	0.10	0.10
Sat Flow, veh/h	2910	4837	1502	2910	4837	1502	2910	3367	1502	2910	3367	1502
Grp Volume(v), veh/h	99	1256	312	88	1514	120	438	233	130	161	191	88
Grp Sat Flow(s),veh/h/ln	1455	1612	1502	1455	1612	1502	1455	1683	1502	1455	1683	1502
Q Serve(g_s), s	2.4	14.5	10.9	2.1	18.9	3.6	10.0	4.4	5.6	3.8	3.8	4.0
Cycle Q Clear(g_c), s	2.4	14.5	10.9	2.1	18.9	3.6	10.0	4.4	5.6	3.8	3.8	4.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	176	2020	627	169	2008	623	409	547	244	235	345	154
V/C Ratio(X)	0.56	0.62	0.50	0.52	0.75	0.19	1.07	0.43	0.53	0.69	0.55	0.57
Avail Cap(c_a), veh/h	409	2382	739	409	2382	739	409	1658	739	409	1658	739
HCM 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
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	32.5	16.3	15.2	32.5	17.7	13.2	30.5	26.8	27.3	31.8	30.4	30.4
Incr Delay (d2), s/veh	2.8	0.4	0.6	2.5	1.2	0.1	64.4	0.5	1.8	3.5	1.4	3.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	4.6	3.1	0.7	6.1	1.0	6.8	1.6	1.9	1.3	1.5	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.3	16.7	15.8	35.0	18.9	13.4	94.9	27.3	29.1	35.3	31.7	33.7
LnGrp LOS	D	B	B	D	B	B	F	C	C	D	C	C
Approach Vol, veh/h		1667			1722			801			440	
Approach Delay, s/veh		17.6			19.3			64.6			33.4	
Approach LOS		B			B			E			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.1	34.7	10.7	16.5	9.3	34.5	15.0	12.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	35.0	10.0	35.0	10.0	35.0	10.0	35.0
Max Q Clear Time (g_c+I1), s	4.1	16.5	5.8	7.6	4.4	20.9	12.0	6.0
Green Ext Time (p_c), s	0.1	9.1	0.2	1.7	0.1	8.6	0.0	1.3

Intersection Summary	
HCM 6th Ctrl Delay	27.9
HCM 6th LOS	C

Intersection						
Int Delay, s/veh	0					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	394	400	0
Future Vol, veh/h	0	0	0	394	400	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	428	435	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	649	218	435	0	-	0
Stage 1	435	-	-	-	-	-
Stage 2	214	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	402	786	1121	-	-	-
Stage 1	620	-	-	-	-	-
Stage 2	801	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	402	786	1121	-	-	-
Mov Cap-2 Maneuver	496	-	-	-	-	-
Stage 1	620	-	-	-	-	-
Stage 2	801	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1121	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-	-
HCM Control Delay (s)	0	-	0	0	-	-
HCM Lane LOS	A	-	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	1	401	0	3	399
Future Vol, veh/h	1	1	401	0	3	399
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	50	50	94	94	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	2	427	0	3	434

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	650	214	0	0	427	0
Stage 1	427	-	-	-	-	-
Stage 2	223	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	402	791	-	-	1129	-
Stage 1	626	-	-	-	-	-
Stage 2	793	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	401	791	-	-	1129	-
Mov Cap-2 Maneuver	496	-	-	-	-	-
Stage 1	626	-	-	-	-	-
Stage 2	791	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	11		0		0.1	
HCM LOS	B					

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	496	791	1129	-
HCM Lane V/C Ratio	-	-	0.004	0.003	0.003	-
HCM Control Delay (s)	-	-	12.3	9.6	8.2	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	0	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	402	402	0
Future Vol, veh/h	0	0	0	402	402	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	180	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	437	437	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	219	437	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	0	785	1119	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	785	1119	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1119	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	0	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	71	790	135	49	733	94	38	151	75	72	59	56
Future Volume (veh/h)	71	790	135	49	733	94	38	151	75	72	59	56
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1575	1772	1772	1575	1772	1772	1575	1772	1772	1575	1772	1772
Adj Flow Rate, veh/h	77	859	147	53	797	102	41	164	82	78	64	61
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	198	1586	492	155	1515	470	129	398	178	199	479	214
Arrive On Green	0.07	0.33	0.33	0.05	0.31	0.31	0.04	0.12	0.12	0.07	0.14	0.14
Sat Flow, veh/h	2910	4837	1502	2910	4837	1502	2910	3367	1502	2910	3367	1502
Grp Volume(v), veh/h	77	859	147	53	797	102	41	164	82	78	64	61
Grp Sat Flow(s),veh/h/ln	1455	1612	1502	1455	1612	1502	1455	1683	1502	1455	1683	1502
Q Serve(g_s), s	1.2	6.7	3.4	0.8	6.3	2.3	0.6	2.1	2.4	1.2	0.8	1.7
Cycle Q Clear(g_c), s	1.2	6.7	3.4	0.8	6.3	2.3	0.6	2.1	2.4	1.2	0.8	1.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	198	1586	492	155	1515	470	129	398	178	199	479	214
V/C Ratio(X)	0.39	0.54	0.30	0.34	0.53	0.22	0.32	0.41	0.46	0.39	0.13	0.29
Avail Cap(c_a), veh/h	629	3659	1136	629	3659	1136	629	2546	1136	629	1819	811
HCM 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
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.6	12.7	11.6	21.1	13.1	11.7	21.4	18.9	19.0	20.6	17.3	17.7
Incr Delay (d2), s/veh	1.3	0.3	0.3	1.3	0.3	0.2	1.4	0.7	1.9	1.3	0.1	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	1.8	0.8	0.3	1.7	0.6	0.2	0.7	0.7	0.4	0.2	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.9	13.0	11.9	22.4	13.3	11.9	22.8	19.6	20.9	21.9	17.5	18.5
LnGrp LOS	C	B	B	C	B	B	C	B	C	C	B	B
Approach Vol, veh/h		1083			952			287			203	
Approach Delay, s/veh		13.5			13.7			20.4			19.5	
Approach LOS		B			B			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.5	20.2	8.2	10.5	8.1	19.5	7.0	11.6
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	35.0	10.0	35.0	10.0	35.0	10.0	25.0
Max Q Clear Time (g_c+I1), s	2.8	8.7	3.2	4.4	3.2	8.3	2.6	3.7
Green Ext Time (p_c), s	0.0	6.5	0.1	1.1	0.1	5.8	0.0	0.4

Intersection Summary			
HCM 6th Ctrl Delay			14.8
HCM 6th LOS			B

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	3	299	1	1	201
Future Vol, veh/h	1	3	299	1	1	201
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	3	325	1	1	218

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	437	163	0	0	326	0
Stage 1	326	-	-	-	-	-
Stage 2	111	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	548	853	-	-	1230	-
Stage 1	704	-	-	-	-	-
Stage 2	901	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	547	853	-	-	1230	-
Mov Cap-2 Maneuver	598	-	-	-	-	-
Stage 1	704	-	-	-	-	-
Stage 2	900	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.6	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	598	853	1230	-
HCM Lane V/C Ratio	-	-	0.002	0.004	0.001	-
HCM Control Delay (s)	-	-	11	9.2	7.9	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	112	1219	305	75	1289	102	370	196	109	148	176	108
Future Volume (veh/h)	112	1219	305	75	1289	102	370	196	109	148	176	108
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1575	1772	1772	1575	1772	1772	1575	1772	1772	1575	1772	1772
Adj Flow Rate, veh/h	122	1325	332	82	1401	111	402	213	118	161	191	117
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	188	1945	604	164	1906	592	409	605	270	235	404	180
Arrive On Green	0.06	0.40	0.40	0.06	0.39	0.39	0.14	0.18	0.18	0.08	0.12	0.12
Sat Flow, veh/h	2910	4837	1502	2910	4837	1502	2910	3367	1502	2910	3367	1502
Grp Volume(v), veh/h	122	1325	332	82	1401	111	402	213	118	161	191	117
Grp Sat Flow(s),veh/h/ln	1455	1612	1502	1455	1612	1502	1455	1683	1502	1455	1683	1502
Q Serve(g_s), s	2.9	16.1	12.1	1.9	17.6	3.4	9.8	3.9	5.0	3.8	3.8	5.3
Cycle Q Clear(g_c), s	2.9	16.1	12.1	1.9	17.6	3.4	9.8	3.9	5.0	3.8	3.8	5.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	188	1945	604	164	1906	592	409	605	270	235	404	180
V/C Ratio(X)	0.65	0.68	0.55	0.50	0.74	0.19	0.98	0.35	0.44	0.69	0.47	0.65
Avail Cap(c_a), veh/h	409	2379	739	409	2379	739	409	1656	739	409	1183	528
HCM 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
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	32.5	17.5	16.3	32.6	18.4	14.1	30.5	25.6	26.0	31.8	29.2	29.9
Incr Delay (d2), s/veh	3.8	0.6	0.8	2.3	0.9	0.2	39.9	0.3	1.1	3.5	0.9	3.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	5.1	3.6	0.7	5.7	1.0	5.3	1.4	1.7	1.3	1.4	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.3	18.1	17.1	34.9	19.3	14.3	70.4	25.9	27.1	35.3	30.1	33.8
LnGrp LOS	D	B	B	C	B	B	E	C	C	D	C	C
Approach Vol, veh/h		1779			1594			733			469	
Approach Delay, s/veh		19.2			19.8			50.5			32.8	
Approach LOS		B			B			D			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.0	33.6	10.7	17.8	9.6	33.0	15.0	13.5
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	35.0	10.0	35.0	10.0	35.0	10.0	25.0
Max Q Clear Time (g_c+I1), s	3.9	18.1	5.8	7.0	4.9	19.6	11.8	7.3
Green Ext Time (p_c), s	0.1	9.2	0.2	1.5	0.1	8.4	0.0	1.2

Intersection Summary	
HCM 6th Ctrl Delay	25.8
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	410	427	0
Future Vol, veh/h	0	0	0	410	427	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	446	464	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	687	232	464	0	-	0
Stage 1	464	-	-	-	-	-
Stage 2	223	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	381	770	1094	-	-	-
Stage 1	599	-	-	-	-	-
Stage 2	793	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	381	770	1094	-	-	-
Mov Cap-2 Maneuver	478	-	-	-	-	-
Stage 1	599	-	-	-	-	-
Stage 2	793	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1094	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-	-
HCM Control Delay (s)	0	-	0	0	-	-
HCM Lane LOS	A	-	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	1	417	0	3	426
Future Vol, veh/h	1	1	417	0	3	426
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	1	453	0	3	463

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	691	227	0	0	453	0
Stage 1	453	-	-	-	-	-
Stage 2	238	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	378	776	-	-	1104	-
Stage 1	607	-	-	-	-	-
Stage 2	779	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	377	776	-	-	1104	-
Mov Cap-2 Maneuver	477	-	-	-	-	-
Stage 1	607	-	-	-	-	-
Stage 2	777	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.1	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	477	776	1104	-
HCM Lane V/C Ratio	-	-	0.002	0.001	0.003	-
HCM Control Delay (s)	-	-	12.6	9.6	8.3	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	0	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	418	429	0
Future Vol, veh/h	0	0	0	418	429	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	180	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	454	466	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	233	466	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	0	769	1092	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	769	1092	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB		NB		SB	
HCM Control Delay, s	0		0		0	
HCM LOS	A					

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1092	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	0	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	315	729	135	49	666	208	38	157	75	177	65	304
Future Volume (veh/h)	315	729	135	49	666	208	38	157	75	177	65	304
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1575	1772	1772	1575	1772	1772	1575	1772	1772	1575	1772	1772
Adj Flow Rate, veh/h	342	792	147	53	724	226	41	171	82	192	71	330
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	424	1683	522	138	1208	375	117	680	303	276	863	385
Arrive On Green	0.15	0.35	0.35	0.05	0.25	0.25	0.04	0.20	0.20	0.09	0.26	0.26
Sat Flow, veh/h	2910	4837	1502	2910	4837	1502	2910	3367	1502	2910	3367	1502
Grp Volume(v), veh/h	342	792	147	53	724	226	41	171	82	192	71	330
Grp Sat Flow(s),veh/h/ln	1455	1612	1502	1455	1612	1502	1455	1683	1502	1455	1683	1502
Q Serve(g_s), s	7.4	8.3	4.6	1.1	8.6	8.6	0.9	2.8	3.0	4.2	1.0	13.6
Cycle Q Clear(g_c), s	7.4	8.3	4.6	1.1	8.6	8.6	0.9	2.8	3.0	4.2	1.0	13.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	424	1683	522	138	1208	375	117	680	303	276	863	385
V/C Ratio(X)	0.81	0.47	0.28	0.38	0.60	0.60	0.35	0.25	0.27	0.70	0.08	0.86
Avail Cap(c_a), veh/h	448	2609	810	448	2609	810	448	1816	810	448	1297	578
HCM 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
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.8	16.5	15.3	30.0	21.5	21.5	30.3	21.8	21.9	28.5	18.3	23.0
Incr Delay (d2), s/veh	10.0	0.2	0.3	1.7	0.5	1.6	1.8	0.2	0.5	3.2	0.0	8.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	2.6	1.3	0.4	2.9	2.7	0.3	1.0	1.0	1.4	0.4	4.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.9	16.7	15.6	31.7	22.0	23.1	32.1	22.0	22.3	31.6	18.4	31.2
LnGrp LOS	D	B	B	C	C	C	C	C	C	C	B	C
Approach Vol, veh/h		1281			1003			294			593	
Approach Delay, s/veh		22.0			22.7			23.5			29.8	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.1	27.6	11.1	18.1	14.4	21.2	7.6	21.6
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	35.0	10.0	35.0	10.0	35.0	10.0	25.0
Max Q Clear Time (g_c+I1), s	3.1	10.3	6.2	5.0	9.4	10.6	2.9	15.6
Green Ext Time (p_c), s	0.0	5.8	0.2	1.2	0.1	5.6	0.0	1.0

Intersection Summary	
HCM 6th Ctrl Delay	23.8
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	271	267	413	290	10
Future Vol, veh/h	6	271	267	413	290	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	295	290	449	315	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1126	163	326	0	-	0
Stage 1	321	-	-	-	-	-
Stage 2	805	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	199	853	1230	-	-	-
Stage 1	708	-	-	-	-	-
Stage 2	400	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	152	853	1230	-	-	-
Mov Cap-2 Maneuver	277	-	-	-	-	-
Stage 1	541	-	-	-	-	-
Stage 2	400	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.5	3.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1230	-	277	853	-	-
HCM Lane V/C Ratio	0.236	-	0.024	0.345	-	-
HCM Control Delay (s)	8.8	-	18.3	11.4	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0.9	-	0.1	1.5	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	3	402	1	1	299
Future Vol, veh/h	1	3	402	1	1	299
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	3	437	1	1	325

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	603	219	0	0	438	0
Stage 1	438	-	-	-	-	-
Stage 2	165	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	430	785	-	-	1118	-
Stage 1	618	-	-	-	-	-
Stage 2	847	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	430	785	-	-	1118	-
Mov Cap-2 Maneuver	511	-	-	-	-	-
Stage 1	618	-	-	-	-	-
Stage 2	846	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	10.2		0		0	
HCM LOS	B					

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	511	785	1118	-
HCM Lane V/C Ratio	-	-	0.002	0.004	0.001	-
HCM Control Delay (s)	-	-	12.1	9.6	8.2	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	0	-

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	94	97	308	206	2
Future Vol, veh/h	0	94	97	308	206	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	180	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	102	105	335	224	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	113	226	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	0	918	1340	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	918	1340	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.4	1.9	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1340	-	918	-	-
HCM Lane V/C Ratio	0.079	-	0.111	-	-
HCM Control Delay (s)	7.9	-	9.4	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0.3	-	0.4	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	338	1165	305	75	1229	199	370	200	109	240	180	343
Future Volume (veh/h)	338	1165	305	75	1229	199	370	200	109	240	180	343
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1575	1772	1772	1575	1772	1772	1575	1772	1772	1575	1772	1772
Adj Flow Rate, veh/h	367	1266	332	82	1336	216	402	217	118	261	196	373
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	404	1950	605	124	1484	461	454	899	401	297	717	320
Arrive On Green	0.14	0.40	0.40	0.04	0.31	0.31	0.16	0.27	0.27	0.10	0.21	0.21
Sat Flow, veh/h	2910	4837	1502	2910	4837	1502	2910	3367	1502	2910	3367	1502
Grp Volume(v), veh/h	367	1266	332	82	1336	216	402	217	118	261	196	373
Grp Sat Flow(s),veh/h/ln	1455	1612	1502	1455	1612	1502	1455	1683	1502	1455	1683	1502
Q Serve(g_s), s	13.4	22.8	18.3	3.0	28.6	12.6	14.6	5.5	6.7	9.6	5.3	23.0
Cycle Q Clear(g_c), s	13.4	22.8	18.3	3.0	28.6	12.6	14.6	5.5	6.7	9.6	5.3	23.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	404	1950	605	124	1484	461	454	899	401	297	717	320
V/C Ratio(X)	0.91	0.65	0.55	0.66	0.90	0.47	0.89	0.24	0.29	0.88	0.27	1.17
Avail Cap(c_a), veh/h	404	1950	605	189	1524	473	485	936	417	297	717	320
HCM 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
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.8	26.0	24.7	50.9	35.8	30.3	44.6	31.0	31.5	47.8	35.5	42.5
Incr Delay (d2), s/veh	23.8	0.8	1.0	5.9	7.6	0.7	16.9	0.1	0.4	24.8	0.2	103.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.0	8.3	6.2	1.2	11.6	4.4	6.1	2.1	2.4	4.3	2.1	17.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	69.6	26.8	25.7	56.8	43.4	31.0	61.6	31.1	31.9	72.6	35.7	145.7
LnGrp LOS	E	C	C	E	D	C	E	C	C	E	D	F
Approach Vol, veh/h		1965			1634			737			830	
Approach Delay, s/veh		34.6			42.4			47.8			96.7	
Approach LOS		C			D			D			F	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	9.6	48.5	16.0	33.8	20.0	38.1	21.8	28.0				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	7.0	42.0	11.0	30.0	15.0	34.0	18.0	23.0				
Max Q Clear Time (g_c+I1), s	5.0	24.8	11.6	8.7	15.4	30.6	16.6	25.0				
Green Ext Time (p_c), s	0.0	8.9	0.0	1.5	0.0	2.6	0.2	0.0				
Intersection Summary												
HCM 6th Ctrl Delay			49.0									
HCM 6th LOS			D									

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	223	219	519	536	8
Future Vol, veh/h	4	223	219	519	536	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	242	238	564	583	9

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1346	296	592	0	-	0
Stage 1	588	-	-	-	-	-
Stage 2	758	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	143	700	980	-	-	-
Stage 1	518	-	-	-	-	-
Stage 2	423	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	108	700	980	-	-	-
Mov Cap-2 Maneuver	235	-	-	-	-	-
Stage 1	392	-	-	-	-	-
Stage 2	423	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.9	2.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	980	-	235	700	-	-
HCM Lane V/C Ratio	0.243	-	0.019	0.346	-	-
HCM Control Delay (s)	9.8	-	20.6	12.8	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	1	-	0.1	1.5	-	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	1	530	0	3	543
Future Vol, veh/h	1	1	530	0	3	543
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	1	576	0	3	590

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	877	288	0	0	576	0
Stage 1	576	-	-	-	-	-
Stage 2	301	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	288	709	-	-	993	-
Stage 1	525	-	-	-	-	-
Stage 2	725	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	287	709	-	-	993	-
Mov Cap-2 Maneuver	403	-	-	-	-	-
Stage 1	525	-	-	-	-	-
Stage 2	723	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	403	709	993	-
HCM Lane V/C Ratio	-	-	0.003	0.002	0.003	-
HCM Control Delay (s)	-	-	14	10.1	8.6	-
HCM Lane LOS	-	-	B	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0	0	-

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	115	109	422	431	2
Future Vol, veh/h	0	115	109	422	431	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	180	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	125	118	459	468	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	235	470	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	0	767	1088	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	767	1088	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.6	1.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1088	-	767	-	-
HCM Lane V/C Ratio	0.109	-	0.163	-	-
HCM Control Delay (s)	8.7	-	10.6	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.4	-	0.6	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑	↱	↰↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Traffic Volume (veh/h)	83	926	158	57	859	110	45	177	88	84	69	66
Future Volume (veh/h)	83	926	158	57	859	110	45	177	88	84	69	66
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1673	1870	1870	1673	1870	1870	1673	1870	1870	1673	1870	1870
Adj Flow Rate, veh/h	90	1007	172	62	934	120	49	192	96	91	75	72
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	220	1796	557	178	1727	536	152	437	195	221	516	230
Arrive On Green	0.07	0.35	0.35	0.06	0.34	0.34	0.05	0.12	0.12	0.07	0.15	0.15
Sat Flow, veh/h	3092	5106	1585	3092	5106	1585	3092	3554	1585	3092	3554	1585
Grp Volume(v), veh/h	90	1007	172	62	934	120	49	192	96	91	75	72
Grp Sat Flow(s),veh/h/ln	1546	1702	1585	1546	1702	1585	1546	1777	1585	1546	1777	1585
Q Serve(g_s), s	1.4	8.0	4.0	1.0	7.5	2.7	0.8	2.5	2.9	1.4	0.9	2.1
Cycle Q Clear(g_c), s	1.4	8.0	4.0	1.0	7.5	2.7	0.8	2.5	2.9	1.4	0.9	2.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	220	1796	557	178	1727	536	152	437	195	221	516	230
V/C Ratio(X)	0.41	0.56	0.31	0.35	0.54	0.22	0.32	0.44	0.49	0.41	0.15	0.31
Avail Cap(c_a), veh/h	613	3542	1100	613	3542	1100	613	2465	1100	613	1761	785
HCM 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
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.4	13.2	11.9	22.9	13.5	12.0	23.2	20.5	20.7	22.4	18.8	19.3
Incr Delay (d2), s/veh	1.2	0.3	0.3	1.2	0.3	0.2	1.2	0.7	1.9	1.2	0.1	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	2.4	1.1	0.3	2.2	0.7	0.3	0.9	1.0	0.5	0.3	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.6	13.5	12.2	24.0	13.8	12.2	24.4	21.2	22.6	23.6	19.0	20.1
LnGrp LOS	C	B	B	C	B	B	C	C	C	C	B	C
Approach Vol, veh/h		1269			1116			337			238	
Approach Delay, s/veh		14.0			14.2			22.1			21.1	
Approach LOS		B			B			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.9	22.7	8.6	11.2	8.6	22.1	7.5	12.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	35.0	10.0	35.0	10.0	35.0	10.0	25.0
Max Q Clear Time (g_c+I1), s	3.0	10.0	3.4	4.9	3.4	9.5	2.8	4.1
Green Ext Time (p_c), s	0.1	7.7	0.1	1.4	0.1	6.9	0.0	0.5

Intersection Summary		
HCM 6th Ctrl Delay		15.6
HCM 6th LOS		B

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	370	237	0
Future Vol, veh/h	0	0	0	370	237	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	402	258	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	459	129	258	0	-	0
Stage 1	258	-	-	-	-	-
Stage 2	201	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	531	897	1304	-	-	-
Stage 1	761	-	-	-	-	-
Stage 2	813	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	531	897	1304	-	-	-
Mov Cap-2 Maneuver	600	-	-	-	-	-
Stage 1	761	-	-	-	-	-
Stage 2	813	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1304	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-	-
HCM Control Delay (s)	0	-	0	0	-	-
HCM Lane LOS	A	-	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	4	350	1	1	236
Future Vol, veh/h	1	4	350	1	1	236
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	4	380	1	1	257

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	512	191	0	0	381	0
Stage 1	381	-	-	-	-	-
Stage 2	131	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	491	818	-	-	1174	-
Stage 1	660	-	-	-	-	-
Stage 2	881	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	491	818	-	-	1174	-
Mov Cap-2 Maneuver	556	-	-	-	-	-
Stage 1	660	-	-	-	-	-
Stage 2	880	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	556	818	1174	-
HCM Lane V/C Ratio	-	-	0.002	0.005	0.001	-
HCM Control Delay (s)	-	-	11.5	9.4	8.1	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	0	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	354	237	0
Future Vol, veh/h	0	0	0	354	237	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	180	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	385	258	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	129	258	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	0	897	1304	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	897	1304	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB		NB		SB	
HCM Control Delay, s	0		0		0	
HCM LOS	A					

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1304	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	0	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	131	1428	357	88	1510	120	434	230	128	173	206	127
Future Volume (veh/h)	131	1428	357	88	1510	120	434	230	128	173	206	127
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1673	1870	1870	1673	1870	1870	1673	1870	1870	1673	1870	1870
Adj Flow Rate, veh/h	142	1552	388	96	1641	130	472	250	139	188	224	138
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	214	2157	670	176	2094	650	404	615	275	266	457	204
Arrive On Green	0.07	0.42	0.42	0.06	0.41	0.41	0.13	0.17	0.17	0.09	0.13	0.13
Sat Flow, veh/h	3092	5106	1585	3092	5106	1585	3092	3554	1585	3092	3554	1585
Grp Volume(v), veh/h	142	1552	388	96	1641	130	472	250	139	188	224	138
Grp Sat Flow(s),veh/h/ln	1546	1702	1585	1546	1702	1585	1546	1777	1585	1546	1777	1585
Q Serve(g_s), s	3.4	19.3	14.3	2.3	21.4	4.0	10.0	4.8	6.1	4.5	4.5	6.4
Cycle Q Clear(g_c), s	3.4	19.3	14.3	2.3	21.4	4.0	10.0	4.8	6.1	4.5	4.5	6.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	214	2157	670	176	2094	650	404	615	275	266	457	204
V/C Ratio(X)	0.66	0.72	0.58	0.55	0.78	0.20	1.17	0.41	0.51	0.71	0.49	0.68
Avail Cap(c_a), veh/h	404	2336	725	404	2336	725	404	1626	725	404	1161	518
HCM 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
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.7	18.3	16.9	35.1	19.6	14.5	33.2	28.1	28.7	34.0	31.0	31.8
Incr Delay (d2), s/veh	3.5	1.0	1.0	2.6	1.6	0.1	99.1	0.4	1.4	3.4	0.8	3.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	6.7	4.5	0.9	7.6	1.3	9.0	1.9	2.2	1.7	1.8	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.2	19.3	17.9	37.7	21.3	14.7	132.4	28.6	30.1	37.5	31.8	35.7
LnGrp LOS	D	B	B	D	C	B	F	C	C	D	C	D
Approach Vol, veh/h		2082			1867			861			550	
Approach Delay, s/veh		20.3			21.6			85.7			34.7	
Approach LOS		C			C			F			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	9.3	37.3	11.6	18.2	10.3	36.4	15.0	14.8				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	10.0	35.0	10.0	35.0	10.0	35.0	10.0	25.0				
Max Q Clear Time (g_c+I1), s	4.3	21.3	6.5	8.1	5.4	23.4	12.0	8.4				
Green Ext Time (p_c), s	0.1	9.3	0.2	1.8	0.1	8.0	0.0	1.5				
Intersection Summary												
HCM 6th Ctrl Delay			32.8									
HCM 6th LOS			C									

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	480	500	0
Future Vol, veh/h	0	0	0	480	500	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	522	543	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	804	272	543	0	-	0
Stage 1	543	-	-	-	-	-
Stage 2	261	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	321	726	1022	-	-	-
Stage 1	546	-	-	-	-	-
Stage 2	759	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	321	726	1022	-	-	-
Mov Cap-2 Maneuver	429	-	-	-	-	-
Stage 1	546	-	-	-	-	-
Stage 2	759	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1022	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-	-
HCM Control Delay (s)	0	-	0	0	-	-
HCM Lane LOS	A	-	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	1	489	0	4	499
Future Vol, veh/h	1	1	489	0	4	499
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	1	532	0	4	542

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	811	266	0	0	532	0
Stage 1	532	-	-	-	-	-
Stage 2	279	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	317	732	-	-	1032	-
Stage 1	553	-	-	-	-	-
Stage 2	743	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	316	732	-	-	1032	-
Mov Cap-2 Maneuver	427	-	-	-	-	-
Stage 1	553	-	-	-	-	-
Stage 2	740	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.7	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	427	732	1032	-
HCM Lane V/C Ratio	-	-	0.003	0.001	0.004	-
HCM Control Delay (s)	-	-	13.5	9.9	8.5	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	0	-

Intersection						
Int Delay, s/veh	0					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	490	503	0
Future Vol, veh/h	0	0	0	490	503	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	180	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	533	547	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	274	547	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	0	724	1018	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	724	1018	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1018	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	0	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	327	865	158	57	792	224	45	183	88	189	75	314
Future Volume (veh/h)	327	865	158	57	792	224	45	183	88	189	75	314
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1673	1870	1870	1673	1870	1870	1673	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	355	940	172	62	861	243	49	199	96	205	82	341
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	436	1856	576	156	1394	433	137	734	327	304	890	397
Arrive On Green	0.14	0.36	0.36	0.05	0.27	0.27	0.04	0.21	0.21	0.09	0.25	0.25
Sat Flow, veh/h	3092	5106	1585	3092	5106	1585	3092	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	355	940	172	62	861	243	49	199	96	205	82	341
Grp Sat Flow(s),veh/h/ln	1546	1702	1585	1546	1702	1585	1546	1777	1585	1728	1777	1585
Q Serve(g_s), s	7.6	9.9	5.3	1.3	10.1	9.0	1.1	3.2	3.5	3.9	1.2	14.1
Cycle Q Clear(g_c), s	7.6	9.9	5.3	1.3	10.1	9.0	1.1	3.2	3.5	3.9	1.2	14.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	436	1856	576	156	1394	433	137	734	327	304	890	397
V/C Ratio(X)	0.81	0.51	0.30	0.40	0.62	0.56	0.36	0.27	0.29	0.67	0.09	0.86
Avail Cap(c_a), veh/h	450	2603	808	450	2603	808	450	1812	808	503	1294	577
HCM 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
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.6	17.0	15.6	31.6	21.8	21.4	31.9	22.9	23.0	30.3	19.7	24.6
Incr Delay (d2), s/veh	10.7	0.2	0.3	1.6	0.5	1.1	1.6	0.2	0.5	2.6	0.0	8.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.2	3.3	1.7	0.5	3.6	3.0	0.4	1.2	1.2	1.6	0.4	5.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.3	17.3	15.9	33.2	22.3	22.6	33.4	23.1	23.5	32.9	19.8	33.3
LnGrp LOS	D	B	B	C	C	C	C	C	C	C	B	C
Approach Vol, veh/h		1467			1166			344			628	
Approach Delay, s/veh		22.4			22.9			24.7			31.4	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.5	30.0	11.0	19.2	14.7	23.7	8.0	22.2
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	35.0	10.0	35.0	10.0	35.0	10.0	25.0
Max Q Clear Time (g_c+I1), s	3.3	11.9	5.9	5.5	9.6	12.1	3.1	16.1
Green Ext Time (p_c), s	0.1	7.0	0.2	1.4	0.1	6.6	0.0	1.1

Intersection Summary	
HCM 6th Ctrl Delay	24.4
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	271	267	467	325	10
Future Vol, veh/h	6	271	267	467	325	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	295	290	508	353	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1193	182	364	0	-	0
Stage 1	359	-	-	-	-	-
Stage 2	834	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	180	829	1191	-	-	-
Stage 1	677	-	-	-	-	-
Stage 2	387	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	136	829	1191	-	-	-
Mov Cap-2 Maneuver	262	-	-	-	-	-
Stage 1	512	-	-	-	-	-
Stage 2	387	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.9	3.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1191	-	262	829	-	-
HCM Lane V/C Ratio	0.244	-	0.025	0.355	-	-
HCM Control Delay (s)	9	-	19.1	11.7	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	1	-	0.1	1.6	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	4	453	1	1	334
Future Vol, veh/h	1	4	453	1	1	334
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	4	492	1	1	363

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	677	247	0	0	493	0
Stage 1	493	-	-	-	-	-
Stage 2	184	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	386	753	-	-	1067	-
Stage 1	579	-	-	-	-	-
Stage 2	829	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	386	753	-	-	1067	-
Mov Cap-2 Maneuver	475	-	-	-	-	-
Stage 1	579	-	-	-	-	-
Stage 2	828	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.4	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	475	753	1067	-
HCM Lane V/C Ratio	-	-	0.002	0.006	0.001	-
HCM Control Delay (s)	-	-	12.6	9.8	8.4	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	0	-

Intersection						
Int Delay, s/veh	2.1					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	94	97	360	241	2
Future Vol, veh/h	0	94	97	360	241	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	180	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	102	105	391	262	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	132	264	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	0	893	1297	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	893	1297	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.6	1.7	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1297	-	893	-	-
HCM Lane V/C Ratio	0.081	-	0.114	-	-
HCM Control Delay (s)	8	-	9.6	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0.3	-	0.4	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	357	1374	357	88	1450	217	434	234	128	265	210	362
Future Volume (veh/h)	357	1374	357	88	1450	217	434	234	128	265	210	362
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1673	1870	1870	1673	1870	1870	1673	1870	1870	1673	1870	1870
Adj Flow Rate, veh/h	388	1493	388	96	1576	236	472	254	139	288	228	393
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	394	2037	632	144	1625	504	506	969	432	309	743	331
Arrive On Green	0.13	0.40	0.40	0.05	0.32	0.32	0.16	0.27	0.27	0.10	0.21	0.21
Sat Flow, veh/h	3092	5106	1585	3092	5106	1585	3092	3554	1585	3092	3554	1585
Grp Volume(v), veh/h	388	1493	388	96	1576	236	472	254	139	288	228	393
Grp Sat Flow(s),veh/h/ln	1546	1702	1585	1546	1702	1585	1546	1777	1585	1546	1777	1585
Q Serve(g_s), s	13.8	27.3	21.4	3.4	33.5	13.1	16.6	6.2	7.7	10.2	6.0	23.0
Cycle Q Clear(g_c), s	13.8	27.3	21.4	3.4	33.5	13.1	16.6	6.2	7.7	10.2	6.0	23.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	394	2037	632	144	1625	504	506	969	432	309	743	331
V/C Ratio(X)	0.99	0.73	0.61	0.67	0.97	0.47	0.93	0.26	0.32	0.93	0.31	1.19
Avail Cap(c_a), veh/h	394	2037	632	197	1625	504	506	969	432	309	743	331
HCM 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
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.9	28.1	26.3	51.6	37.0	30.0	45.4	31.3	31.9	49.1	36.8	43.5
Incr Delay (d2), s/veh	41.5	1.4	1.8	5.3	15.8	0.7	24.5	0.1	0.4	33.7	0.2	110.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.4	10.7	7.8	1.4	15.5	4.8	7.8	2.5	2.9	5.2	2.5	18.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	89.4	29.5	28.1	56.9	52.7	30.7	69.9	31.5	32.3	82.9	37.0	153.5
LnGrp LOS	F	C	C	E	D	C	E	C	C	F	D	F
Approach Vol, veh/h		2269			1908			865			909	
Approach Delay, s/veh		39.5			50.2			52.6			101.9	
Approach LOS		D			D			D			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.1	48.9	16.0	35.0	19.0	40.0	23.0	28.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	7.0	42.0	11.0	30.0	14.0	35.0	18.0	23.0
Max Q Clear Time (g_c+I1), s	5.4	29.3	12.2	9.7	15.8	35.5	18.6	25.0
Green Ext Time (p_c), s	0.0	8.5	0.0	1.7	0.0	0.0	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	54.4
HCM 6th LOS	D

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	223	219	589	609	8
Future Vol, veh/h	4	223	219	589	609	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	242	238	640	662	9

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1463	336	671	0	-	0
Stage 1	667	-	-	-	-	-
Stage 2	796	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	119	660	915	-	-	-
Stage 1	472	-	-	-	-	-
Stage 2	405	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	88	660	915	-	-	-
Mov Cap-2 Maneuver	211	-	-	-	-	-
Stage 1	349	-	-	-	-	-
Stage 2	405	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.8	2.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	915	-	211	660	-	-
HCM Lane V/C Ratio	0.26	-	0.021	0.367	-	-
HCM Control Delay (s)	10.3	-	22.4	13.6	-	-
HCM Lane LOS	B	-	C	B	-	-
HCM 95th %tile Q(veh)	1	-	0.1	1.7	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	1	602	0	4	616
Future Vol, veh/h	1	1	602	0	4	616
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	1	654	0	4	670

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	997	327	0	0	654	0
Stage 1	654	-	-	-	-	-
Stage 2	343	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	241	669	-	-	929	-
Stage 1	479	-	-	-	-	-
Stage 2	690	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	240	669	-	-	929	-
Mov Cap-2 Maneuver	361	-	-	-	-	-
Stage 1	479	-	-	-	-	-
Stage 2	687	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.7	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	361	669	929	-
HCM Lane V/C Ratio	-	-	0.003	0.002	0.005	-
HCM Control Delay (s)	-	-	15	10.4	8.9	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0	0	-

Intersection						
Int Delay, s/veh	1.8					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	115	109	494	505	2
Future Vol, veh/h	0	115	109	494	505	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	180	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	125	118	537	549	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	276	551	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	0	721	1015	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	721	1015	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11	1.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1015	-	721	-	-
HCM Lane V/C Ratio	0.117	-	0.173	-	-
HCM Control Delay (s)	9	-	11	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.4	-	0.6	-	-

APPENDIX D – SimTraffic Queuing Worksheets

Intersection: 1: Mariposa Rd & Nisqualli Rd

Movement	EB	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB
Directions Served	L	L	T	T	T	R	L	T	T	T	R	L
Maximum Queue (ft)	203	198	200	170	82	99	106	253	229	59	100	93
Average Queue (ft)	107	84	95	69	19	18	43	145	86	10	41	26
95th Queue (ft)	181	153	171	134	53	48	77	215	177	33	75	62
Link Distance (ft)			510	510	510			481	481	481		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	350	350				220	175				283	300
Storage Blk Time (%)								2				
Queuing Penalty (veh)								1				

Intersection: 1: Mariposa Rd & Nisqualli Rd

Movement	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	T	T	R	L	L	T	T	R
Maximum Queue (ft)	155	48	48	190	212	83	75	89
Average Queue (ft)	79	8	20	32	74	23	28	53
95th Queue (ft)	138	27	43	98	129	58	61	85
Link Distance (ft)	1210	1210				315	315	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)			175	210	210			210
Storage Blk Time (%)				0	0			
Queuing Penalty (veh)				0	0			

Intersection: 2: Mariposa Rd & Maverik South Dvwy

Movement	EB	EB	NB	NB
Directions Served	L	R	L	T
Maximum Queue (ft)	28	108	173	202
Average Queue (ft)	4	60	65	7
95th Queue (ft)	19	99	129	69
Link Distance (ft)	161	161		315
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			100	
Storage Blk Time (%)			2	
Queuing Penalty (veh)			5	

Intersection: 3: Mariposa Rd & Church/School Dvwy

Movement	WB
Directions Served	R
Maximum Queue (ft)	30
Average Queue (ft)	1
95th Queue (ft)	10
Link Distance (ft)	178
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: Mariposa Rd & Maverik North Dvwy

Movement	EB	NB
Directions Served	R	L
Maximum Queue (ft)	67	55
Average Queue (ft)	34	14
95th Queue (ft)	54	44
Link Distance (ft)	142	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		120
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 6

Intersection: 1: Mariposa Rd & Nisqualli Rd

Movement	EB	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB
Directions Served	L	L	T	T	T	R	L	L	T	T	T	R
Maximum Queue (ft)	220	199	322	232	202	135	115	265	436	338	281	104
Average Queue (ft)	120	123	175	155	96	47	6	91	283	237	144	38
95th Queue (ft)	198	200	250	224	184	89	42	237	385	334	260	83
Link Distance (ft)			510	510	510				481	481	481	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	350	350				220	175	175				283
Storage Blk Time (%)					0				35		0	
Queuing Penalty (veh)					0				26		0	

Intersection: 1: Mariposa Rd & Nisqualli Rd

Movement	NB	NB	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	L	L	T	T	R	L	L	T	T	R
Maximum Queue (ft)	232	245	133	128	83	148	178	120	117	157
Average Queue (ft)	128	177	72	32	33	91	114	66	68	76
95th Queue (ft)	217	239	131	75	64	150	156	109	122	120
Link Distance (ft)			1210	1210				315	315	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300	300			175	210	210			210
Storage Blk Time (%)										
Queuing Penalty (veh)										

Intersection: 2: Mariposa Rd & Maverik South Dvwy

Movement	EB	EB	NB	SB	SB
Directions Served	L	R	L	T	TR
Maximum Queue (ft)	52	156	176	29	22
Average Queue (ft)	6	63	70	1	2
95th Queue (ft)	27	115	123	10	13
Link Distance (ft)	161	161		42	42
Upstream Blk Time (%)		0		0	
Queuing Penalty (veh)		0		0	
Storage Bay Dist (ft)			100		
Storage Blk Time (%)			2		
Queuing Penalty (veh)			5		

Intersection: 3: Mariposa Rd & Church/School Dvwy

Movement	WB
Directions Served	R
Maximum Queue (ft)	31
Average Queue (ft)	1
95th Queue (ft)	11
Link Distance (ft)	178
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: Mariposa Rd & Maverik North Dvwy

Movement	EB	NB
Directions Served	R	L
Maximum Queue (ft)	77	98
Average Queue (ft)	39	29
95th Queue (ft)	59	58
Link Distance (ft)	142	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		120
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 31

Intersection: 1: Mariposa Rd & Nisqualli Rd

Movement	EB	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB
Directions Served	L	L	T	T	T	R	L	L	T	T	T	R
Maximum Queue (ft)	261	198	209	184	106	56	25	89	265	216	128	125
Average Queue (ft)	127	104	109	98	27	22	3	35	168	108	20	45
95th Queue (ft)	219	174	175	168	69	42	18	73	240	194	54	95
Link Distance (ft)			510	510	510				481	481	481	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	350	350				220	175	175				283
Storage Blk Time (%)									6			
Queuing Penalty (veh)									3			

Intersection: 1: Mariposa Rd & Nisqualli Rd

Movement	NB	NB	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	L	L	T	T	R	L	L	T	T	R
Maximum Queue (ft)	29	89	196	125	47	121	140	52	89	96
Average Queue (ft)	4	30	90	24	21	53	87	25	25	51
95th Queue (ft)	19	64	155	80	38	118	138	52	58	77
Link Distance (ft)			1210	1210				315	315	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300	300			175	210	210			210
Storage Blk Time (%)										
Queuing Penalty (veh)										

Intersection: 2: Mariposa Rd & Maverik South Dvwy

Movement	EB	EB	NB	SB
Directions Served	L	R	L	TR
Maximum Queue (ft)	28	176	138	20
Average Queue (ft)	6	57	70	1
95th Queue (ft)	23	96	115	7
Link Distance (ft)	161	161		42
Upstream Blk Time (%)		0		
Queuing Penalty (veh)		0		
Storage Bay Dist (ft)			100	
Storage Blk Time (%)			2	
Queuing Penalty (veh)			4	

Intersection: 3: Mariposa Rd & Church/School Dvwy

Movement	WB	WB
Directions Served	L	R
Maximum Queue (ft)	30	52
Average Queue (ft)	1	6
95th Queue (ft)	10	29
Link Distance (ft)	178	178
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Mariposa Rd & Maverik North Dvwy

Movement	EB	NB
Directions Served	R	L
Maximum Queue (ft)	79	53
Average Queue (ft)	35	22
95th Queue (ft)	53	48
Link Distance (ft)	142	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		120
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 7

Intersection: 1: Mariposa Rd & Nisqualli Rd

Movement	EB	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB
Directions Served	L	L	T	T	T	R	L	L	T	T	T	R
Maximum Queue (ft)	240	276	368	300	260	188	116	265	496	433	319	83
Average Queue (ft)	124	149	231	202	152	51	24	136	367	299	204	50
95th Queue (ft)	221	240	308	273	239	105	74	311	496	394	313	85
Link Distance (ft)			510	510	510				481	481	481	
Upstream Blk Time (%)									1			
Queuing Penalty (veh)									0			
Storage Bay Dist (ft)	350	350				220	175	175				283
Storage Blk Time (%)			0		0				45		0	
Queuing Penalty (veh)			1		0				39		0	

Intersection: 1: Mariposa Rd & Nisqualli Rd

Movement	NB	NB	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	L	L	T	T	R	L	L	T	T	R
Maximum Queue (ft)	228	270	175	158	133	180	201	118	133	163
Average Queue (ft)	148	185	103	60	41	106	134	64	57	83
95th Queue (ft)	214	239	164	124	89	167	189	104	101	137
Link Distance (ft)			1210	1210				315	315	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300	300			175	210	210			210
Storage Blk Time (%)				0			0			
Queuing Penalty (veh)				0			0			

Intersection: 2: Mariposa Rd & Maverik South Dvwy

Movement	EB	EB	NB	SB
Directions Served	L	R	L	TR
Maximum Queue (ft)	50	111	144	22
Average Queue (ft)	5	50	72	1
95th Queue (ft)	24	79	129	8
Link Distance (ft)	161	161		42
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			100	
Storage Blk Time (%)			3	
Queuing Penalty (veh)			10	

Intersection: 3: Mariposa Rd & Church/School Dvwy

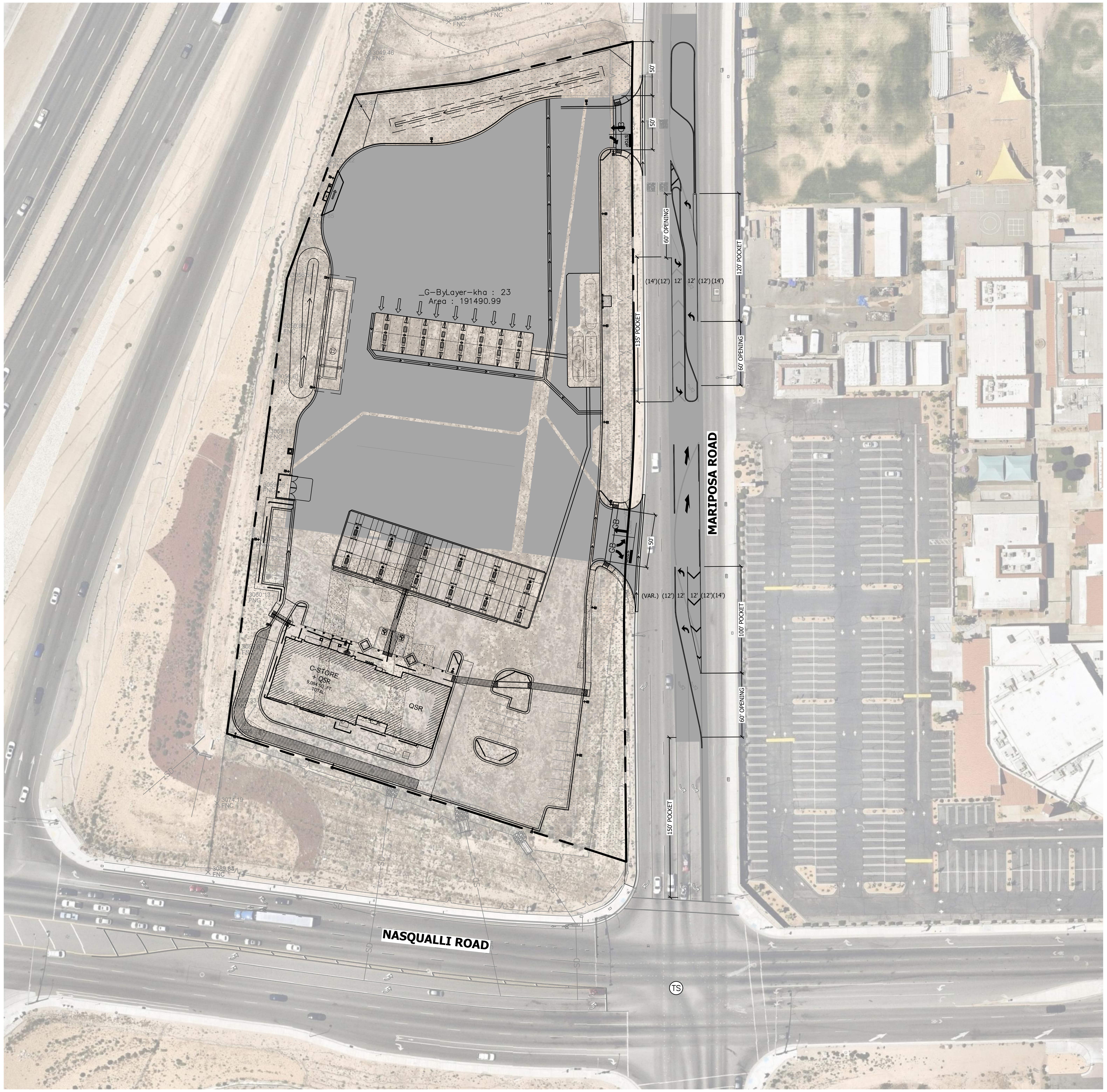
Movement	WB	SB
Directions Served	R	L
Maximum Queue (ft)	30	27
Average Queue (ft)	3	3
95th Queue (ft)	18	17
Link Distance (ft)	178	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		180
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Mariposa Rd & Maverik North Dvwy

Movement	EB	NB
Directions Served	R	L
Maximum Queue (ft)	56	73
Average Queue (ft)	36	30
95th Queue (ft)	56	64
Link Distance (ft)	142	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		120
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 51



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NORTH

BLDG Number	GP Number	Project Number

Kimley»Horn

3880 LEMON STREET, STE. 420, RIVERSIDE, CA 92501
PHONE: 951-543-9868

REGISTERED PROFESSIONAL ENGINEER
SHEA-MICHAEL ANTI
RCE NO. 78274
CIVIL
STATE OF CALIFORNIA

Seal

7/1/2021

MAVERIK
STORE #:TBD
MARIPOSA ROAD & NASQUALLI ROAD
VICTORVILLE, CA

MAVERIK
185 SOUTH STATE STREET, SUITE 800
SALT LAKE CITY, UT. 84111

REVISION

No.	DESCRIPTION	DATE	APPROVED

CITY OF VICTORVILLE CALIFORNIA

CITY CASE NO.

CITY OF VICTORVILLE ENGINEERING DEPARTMENT

14343 Civic Drive, Victorville, CA 92392 (760) 955-5000

Approved By:

Brian W. Gengler, RCE C44730
City Engineer

DATE

Sheet Name

Sheet Number

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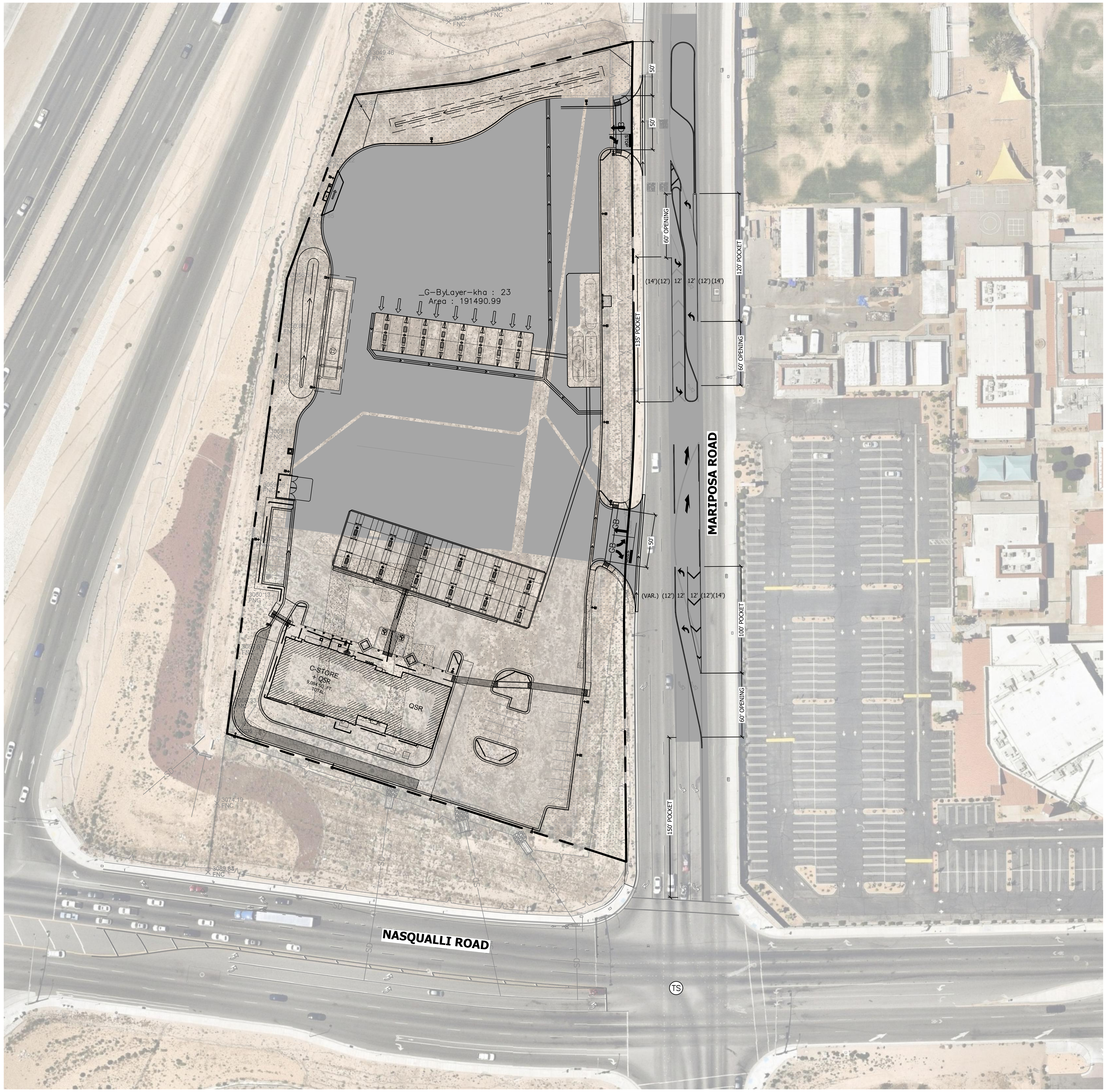

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NORTH

BLDG Number	GP Number	Project Number

Kimley»Horn
© 2021 KIMLEY-HORN AND ASSOCIATES, INC.
3880 LEMON STREET, STE. 420, RIVERSIDE, CA 92501
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VICTORVILLE, CA

MAVERIK
185 SOUTH STATE STREET, SUITE 800
SALT LAKE CITY, UT. 84111

REVISION

No.	DESCRIPTION	DATE	APPROVED

CITY OF VICTORVILLE
INCORPORATED SEPT. 21, 1962
HOME OF THE SAN BERNARDINO COUNTY FAIR
CALIFORNIA

CITY CASE NO.

CITY OF VICTORVILLE
ENGINEERING DEPARTMENT
14343 Civic Drive, Victorville, CA 92392 (760) 955-5000

Approved By:

Brian W. Gengler, RCE C44730
City Engineer

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