Appendix 1

Air Quality & Greenhouse Gas Impact Analysis

AIR QUALITY & GREENHOUSE GAS IMPACT ANALYSIS

FOR

FOWLER - MCKINLEY ELEMENTARY SCHOOL PROJECT

CLOVIS UNIFIED SCHOOL DISTRICT
FRESNO COUNTY, CA

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AAM	Annual Arithmetic Mean
AHERA	Asbestos Hazard Emergency Response Act
ASHAA	Asbestos School Hazard Abatement Act
ASHARA	Asbestos School Hazard Abatement and Reauthorization Act
ATCM	Airborne Toxic Control Measure
CAAQS	California Ambient Air Quality Standards
ARB	California Air Resources Board
CCAA	California Clean Air Act
CCAR	California Climate Action Registry
CEQA	California Environmental Quality Act
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
DPM	Diesel-Exhaust Particulate Matter or Diesel-Exhaust PM
DRRP	Diesel Risk Reduction Plan
FCAA	Federal Clean Air Act
GHG	Greenhouse Gases
HAP	Hazardous Air Pollutant
IPCC	Intergovernmental Panel on Climate Change
LOS	Level of Service
N_2O	Nitrous Oxide
NAAQS	National Ambient Air Quality Standards
NESHAPs	National Emission Standards for HAPs
NO_x	Oxides of Nitrogen
O_3	Ozone
Pb	Lead
PM	Particulate Matter
PM_{10}	Particulate Matter (less than 10 µm)
$PM_{2.5}$	Particulate Matter (less than 2.5 µm)
ppb	Parts per Billion
ppm	Parts per Million
ROG	Reactive Organic Gases
SIP	State Implementation Plan
SJVAB	San Joaquin Valley Air Basin
SJVAPCD	San Joaquin Valley Air Pollution Control District
SO_2	Sulfur Dioxide
SRTS	Safe Routes to School
TAC	Toxic Air Contaminant
TSCA	Toxic Substances Control Act
$\mu g/m^3$	Micrograms per cubic meter
U.S. EPA	United State Environmental Protection Agency

INTRODUCTION

This report describes the existing environment in the project vicinity and identifies potential air quality and greenhouse gas impacts associated with the proposed project. Project impacts are evaluated relative to applicable thresholds of significance. Mitigation measures have been identified for significant impacts.

PROPOSED PROJECT SUMMARY

The proposed project includes the acquisition of a 22-acre school site and the construction and operation of an elementary school on the site. The site is located on the northeast corner of Fowler Avenue and the McKinley Avenue alignment. The elementary school would serve up to 750 students in grades TK-6. The campus would have approximately 28 classrooms, administrative offices, a multi-purpose building, hardcourt areas and athletic fields that could potentially be lighted. The school would have approximately fifty employees, including administrators, faculty, and support staff. The school would be in regular session on weekdays from late August to early June, but may host special events and classes during evenings, on weekends, and during summer recess. The project includes annexation of the site to the City of Fresno. The project site location and nearby land uses are depicted in Figure 1.

The timing for construction of the school would depend on enrollment growth and funding availability. The District estimates that the school could be constructed in approximately five years.

AIR QUALITY

EXISTING SETTING

The project is located within the San Joaquin Valley Air Basin (SJVAB). The SJVAB is within the jurisdiction of the San Joaquin Valley Air Pollution Control District (SJVAPCD). Air quality in the SJVAB is influenced by a variety of factors, including topography, local and regional meteorology. Factors affecting regional and local air quality are discussed below.

TOPOGRAPHY, METEOROLOGY, AND POLLUTANT DISPERSION

The dispersion of air pollution in an area is determined by such natural factors as topography, meteorology, and climate, coupled with atmospheric stability conditions and the presence of inversions. The factors affecting the dispersion of air pollution with respect to the SJVAB are discussed below.

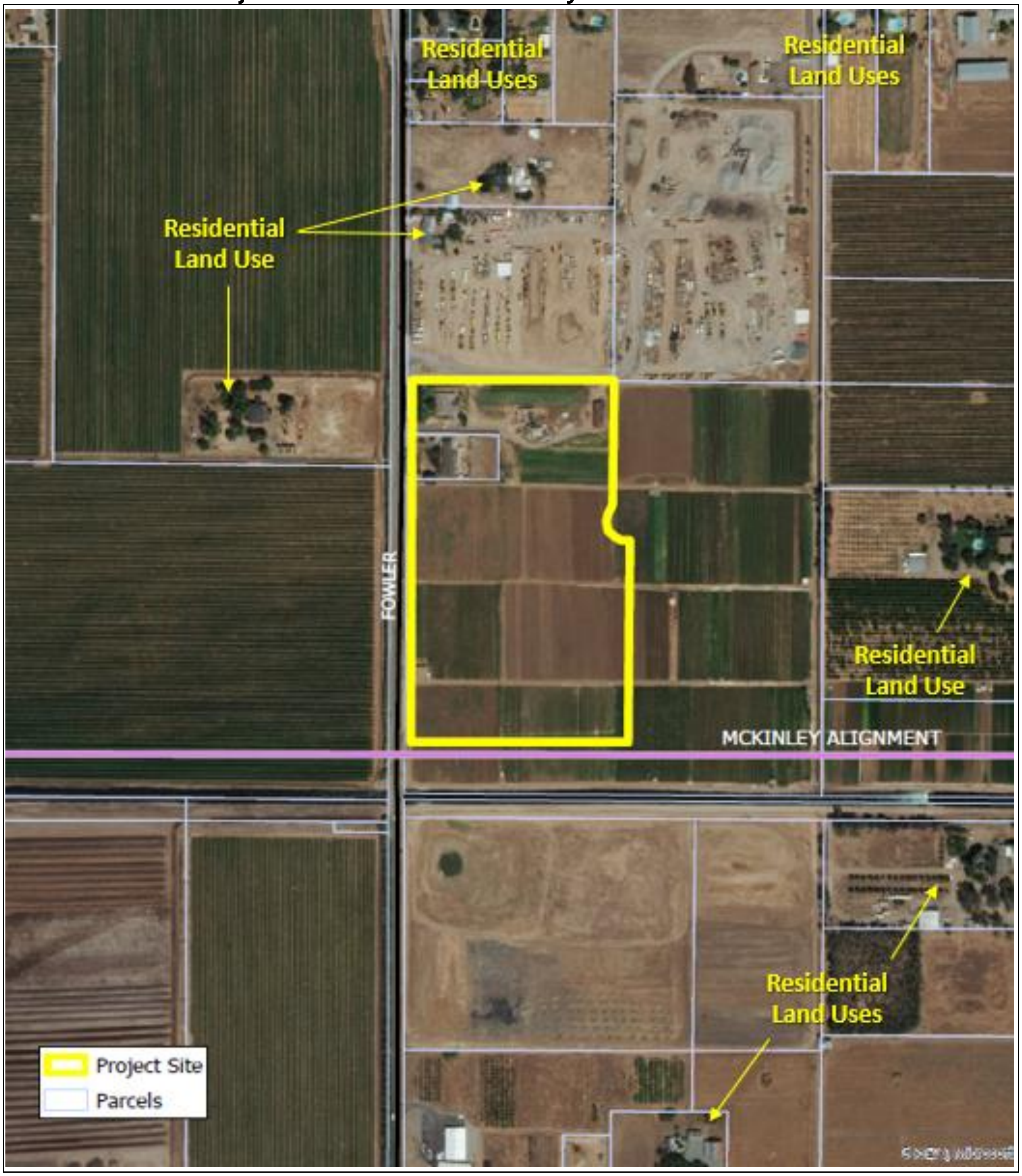
Topography

The SJVAB occupies the southern half of the Central Valley. The SJVAB is open to the north, and is surrounded by mountain ranges on all other sides. The Coast Ranges, which have an average elevation of 3,000 feet, are along on the western boundary of the SJVAB, while the Sierra Nevada Mountains (8,000 to 14,000 feet in elevation) are along the eastern border. The San Emigdio Mountains, which are part of the Coast Ranges, and the Tehachapi Mountains, which are part of the Sierra Nevada, form the southern boundary, and have an elevation of 6,000 to 8,000 feet. The SJVAB is mostly flat with a downward gradient in terrain to the northwest.

Meteorology and Climate

The SJVAB has an inland Mediterranean climate that is strongly influenced by the presence of mountain ranges. The mountain ranges to the west and south induce winter storms from the Pacific Ocean to release precipitation on the western slopes producing a partial rain shadow over the valley. In addition, the mountain ranges block the free circulation of air to the east, trapping stable air in the valley for extended periods during the cooler half of the year.

Figure 1
Project Site Location and Nearby Sensitive Land Uses



Source: OPR 2018

Winter in the SJVAB is characterized as mild and fairly humid, while the summer is typically hot, dry, and cloudless. The climate is a result of the topography and the strength and location of a semi permanent, subtropical high-pressure cell. During the summer months, the Pacific high-pressure cell is centered over the northeastern Pacific Ocean, resulting in stable meteorological conditions and a steady northwesterly wind flow. Upwelling of cold ocean water from below to the surface as a result of the northwesterly flow produces a band of cold water off the California coast. In winter, the Pacific high-pressure cell weakens and shifts southward, resulting in wind flow offshore, the absence of upwelling, and the occurrence of storms.

The annual temperature, humidity, precipitation, and wind patterns reflect the topography of the SJVAB and the strength and location of the semi permanent, subtropical high-pressure cell. Summer temperatures that often exceed 100 degrees Fahrenheit (°F) and clear sky conditions are favorable to ozone formation. Most of the precipitation in the valley occurs as rainfall during winter storms. The winds and unstable atmospheric conditions associated with the passage of winter storms result in periods of low air pollution and excellent visibility. However, between winter storms, high pressure and light winds lead to the creation of low-level temperature inversions and stable atmospheric conditions, which can result in higher pollutant concentrations. The orientation of the wind flow pattern in the SJVAB is parallel to the valley and mountain ranges. Summer wind conditions promote the transport of ozone and precursors from the San Francisco Bay Area through the Carquinez Strait, a gap in the Coast Ranges, and low-mountain passes such as Altamont Pass and Pacheco Pass. During the summer, predominant wind direction is from the northwest. During the winter, the predominant wind direction is from the southeast. Calm conditions are also predominant during the winter (ARB 1992).

The climate is semi-arid, with an annual normal precipitation of approximately 11 inches. Temperatures in the project area range from an average minimum of approximately 38°F, in January, to an average maximum of 98°F, in July (WRCC 2018).

Atmospheric Stability and Inversions

Stability describes the resistance of the atmosphere to vertical motion. The stability of the atmosphere is dependent on the vertical distribution of temperature with height. Stability categories range from "Extremely Unstable" (Class A), through Neutral (Class D), to "Stable" (Class F). Unstable conditions often occur during daytime hours when solar heating warms the lower atmospheric layers sufficiently. Under Class A stability conditions, large fluctuations in horizontal wind direction occur coupled with large vertical mixing depths. Under Class B stability conditions, wind direction fluctuations and the vertical mixing depth are less pronounced because of a decrease in the amount of solar heating. Under Class C stability conditions, solar heating is weak along with horizontal and vertical fluctuations because of a combination of thermal and mechanical turbulence. Under Class D stability conditions, vertical motions are primarily generated by mechanical turbulence. Under Class E and Class F stability conditions, air pollution emitted into the atmosphere travels downwind with poor dispersion. The dispersive power of the atmosphere decreases with progression through the categories from A to F.

With respect to the SJVAB, Classes D through F are predominant during the late fall and winter because of cool temperatures and entrapment of cold air near the surface. March and August are transition months with equally occurring percentages of Class F and Class A. During the spring months of April and May and the summer months of June and July, Class A is predominant. The fall months of September, October, and November have comparable percentages of Class A and Class F.

An inversion is a layer of warmer air over a layer of cooler air. Inversions influence the mixing depth of the atmosphere, which is the vertical depth available for diluting air pollution near the ground, thus significantly affecting air quality conditions. The SJVAB experiences both surface-based and elevated inversions. The shallow surface-based inversions are present in the morning but are often broken by daytime heating of the air layers near the ground. The deep elevated inversions occur less frequently than the surface-based inversions but generally result in more severe stagnation. The surface-based inversions occur more frequently in the fall, and the stronger elevated inversions usually occur during December and January.

AIR POLLUTANTS OF CONCERN

Criteria Air Pollutants

For the protection of public health and welfare, the Federal Clean Air Act (FCAA) required that the United States Environmental Protection Agency (U.S. EPA) establish National Ambient Air Quality Standards (NAAQS) for various pollutants. These pollutants are referred to as "criteria" pollutants because the U.S. EPA publishes criteria documents to justify the choice of standards. These standards define the maximum amount of an air pollutant that can be present in ambient air. An ambient air quality standard is generally specified as a concentration averaged over a specific time period, such as one hour, eight hours, 24 hours, or one year. The different averaging times and concentrations are meant to protect against different exposure effects. Standards established for the protection of human health are referred to as primary standards; whereas, standards established for the prevention of environmental and property damage are called secondary standards. The FCAA allows states to adopt additional or more health-protective standards. The air quality regulatory framework and ambient air quality standards are discussed in greater detail later in this report.

The following provides a summary discussion of the primary and secondary criteria air pollutants of primary concern. In general, primary pollutants are directly emitted into the atmosphere, and secondary pollutants are formed by chemical reactions in the atmosphere.

Ozone (O_3) is a reactive gas consisting of three atoms of oxygen. In the troposphere, it is a product of the photochemical process involving the sun's energy. It is a secondary pollutant that is formed when NO_X and volatile organic compounds (VOC) react in the presence of sunlight. Ozone at the earth's surface causes numerous adverse health effects and is a criteria pollutant. It is a major component of smog. In the stratosphere, ozone exists naturally and shields Earth from harmful incoming ultraviolet radiation.

High concentrations of ground level ozone can adversely affect the human respiratory system and aggravate cardiovascular disease and many respiratory ailments. Ozone also damages natural ecosystems such as forests and foothill communities, agricultural crops, and some man-made materials, such as rubber, paint, and plastics.

Reactive Organic Gas (ROG) is a reactive chemical gas, composed of hydrocarbon compounds that may contribute to the formation of smog by their involvement in atmospheric chemical reactions. No separate health standards exist for ROG as a group. Because some compounds that make up ROG are also toxic, like the carcinogen benzene, they are often evaluated as part of a toxic risk assessment. Total Organic Gases (TOGs) includes all of the ROGs, in addition to low reactivity organic compounds like methane and acetone. ROGs and VOC are subsets of TOG.

Volatile Organic Compounds (VOC) are hydrocarbon compounds that exist in the ambient air. VOCs contribute to the formation of smog and may also be toxic. VOC emissions are a major precursor to the formation of ozone. VOCs often have an odor, and some examples include gasoline, alcohol, and the solvents used in paints.

Oxides of Nitrogen (NO_X) are a family of gaseous nitrogen compounds and is a precursor to the formation of ozone and particulate matter. The major component of NO_X, nitrogen dioxide (NO_2), is a reddish-brown gas that is toxic at high concentrations. NO_X results primarily from the combustion of fossil fuels under high temperature and pressure. On-road and off-road motor vehicles and fuel combustion are the major sources of this air pollutant.

Particulate Matter (PM), also known as particle pollution, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. The size of particles is directly linked to their potential for causing health problems. U.S. EPA is concerned about particles that are 10 micrometers in diameter or smaller because those are the particles that generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. U.S. EPA groups particle pollution into three categories based on their size and where they are deposited:

- "Inhalable coarse particles ($PM_{2.5}$- PM_{10})," such as those found near roadways and dusty industries, are between 2.5 and 10 micrometers in diameter. $PM_{2.5-10}$ is deposited in the thoracic region of the lungs.
- "Fine particles ($PM_{2.5}$)," such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries and automobiles react in the air. They penetrate deeply into the thoracic and alveolar regions of the lungs.
- "Ultrafine particles (UFP)," are very small particles less than 0.1 micrometers in diameter largely resulting from the combustion of fossils fuels, meat, wood and other hydrocarbons. While UFP mass is a small portion of $PM_{2.5}$, its high surface area, deep lung penetration, and transfer into the bloodstream can result in disproportionate health impacts relative to their mass.

PM_{10}, $PM_{2.5}$, and UFP include primary pollutants (emitted directly to the atmosphere) as well as secondary pollutants (formed in the atmosphere by chemical reactions among precursors). Generally speaking, $PM_{2.5}$ and UFP are emitted by combustion sources like vehicles, power generation, industrial processes, and wood burning, while PM_{10} sources include these same sources plus roads and farming activities. Fugitive windblown dust and other area sources also represent a source of airborne dust.

Numerous scientific studies have linked both long- and short-term particle pollution exposure to a variety of health problems. Long-term exposures, such as those experienced by people living for many years in areas with high particle levels, have been associated with problems such as reduced lung function and the development of chronic bronchitis and even premature death. Short-term exposures to particles (hours or days) can aggravate lung disease, causing asthma attacks and also acute (short-term) bronchitis, and may also increase susceptibility to respiratory infections. In people with heart disease, short-term exposures have been linked to heart attacks and arrhythmias. Healthy children and adults have not been reported to suffer serious effects from short term exposures, although they may experience temporary minor irritation when particle levels are elevated.

Carbon Monoxide (CO) is an odorless, colorless gas that is highly toxic. It is formed by the incomplete combustion of fuels and is emitted directly into the air (unlike ozone). The main source of CO is on-road motor vehicles. Other CO sources include other mobile sources, miscellaneous processes, and fuel combustion from stationary sources. Because of the local nature of CO problems, the California Air Resources Board (ARB) and U.S. EPA designate urban areas as CO nonattainment areas instead of the entire basin as with ozone and PM_{10}. Motor vehicles are by far the largest source of CO emissions. Emissions from motor vehicles have been declining since 1985, despite increases in vehicle miles traveled, with the introduction of new automotive emission controls and fleet turnover.

Sulfur Dioxide (SO_2) is a colorless, irritating gas with a "rotten egg" smell formed primarily by the combustion of sulfur-containing fossil fuels. However, like airborne NO_X, suspended SO_X particles contribute to the poor visibility. These SO_X particles can also combine with other pollutants to form $PM_{2.5}$. The prevalence of low-sulfur fuel use has minimized problems from this pollutant.

Lead (Pb) is a metal that is a natural constituent of air, water, and the biosphere. Lead is neither created nor destroyed in the environment, so it essentially persists forever. The health effects of lead poisoning include loss of appetite, weakness, apathy, and miscarriage. Lead can also cause lesions of the neuromuscular system, circulatory system, brain, and gastrointestinal tract. Gasoline-powered automobile engines were a major source of airborne lead through the use of leaded fuels. The use of leaded fuel has been mostly phased out, with the result that ambient concentrations of lead have dropped dramatically.

Hydrogen Sulfide (H_2S) is associated with geothermal activity, oil and gas production, refining, sewage treatment plants, and confined animal feeding operations. Hydrogen sulfide is extremely hazardous in high concentrations; especially in enclosed spaces (800 ppm can cause death). OSHA regulates workplace exposure to H_2S.

Other Pollutants

The State of California has established air quality standards for some pollutants not addressed by Federal standards. The ARB has established State standards for hydrogen sulfide, sulfates, vinyl chloride, and visibility reducing particles. The following section summarizes these pollutants and provides a description of the pollutants' physical properties, health and other effects, sources, and the extent of the problems.

Sulfates (SO_4^{2-}) are the fully oxidized ionic form of sulfur. Sulfates occur in combination with metal and/or hydrogen ions. In California, emissions of sulfur compounds occur primarily from the combustion of petroleum-derived fuels (e.g., gasoline and diesel fuel) that contain sulfur. This sulfur is oxidized to SO_2 during the combustion process and subsequently converted to sulfate compounds in the atmosphere. The conversion of SO_2 to sulfates takes place comparatively rapidly and completely in urban areas of California due to regional meteorological features.

The ARB sulfates standard is designed to prevent aggravation of respiratory symptoms. Effects of sulfate exposure at levels above the standard include a decrease in ventilator function, aggravation of asthmatic symptoms, and an increased risk of cardio-pulmonary disease. Sulfates are particularly effective in degrading visibility, and, due to the fact that they are usually acidic, can harm ecosystems and damage materials and property.

Visibility Reducing Particles: Are a mixture of suspended particulate matter consisting of dry solid fragments, solid cores with liquid coatings, and small droplets of liquid. The standard is intended to limit the frequency and severity of visibility impairment due to regional haze and is equivalent to a 10-mile nominal visual range.

Vinyl Chloride (C_2H_3Cl or **VCM)** is a colorless gas that does not occur naturally. It is formed when other substances such as trichloroethane, trichloroethylene, and tetrachloro-ethylene are broken down. Vinyl chloride is used to make polyvinyl chloride (PVC) which is used to make a variety of plastic products, including pipes, wire and cable coatings, and packaging materials.

Odors

Typically odors are generally regarded as an annoyance rather than a health hazard. However, manifestations of a person's reaction to foul odors can range from the psychological (i.e. irritation, anger, or anxiety) to the physiological, including circulatory and respiratory effects, nausea, vomiting, and headache.

The ability to detect odors varies considerably among the population and overall is quite subjective. Some individuals have the ability to smell very minute quantities of specific substances; others may not have the same sensitivity but may have sensitivities to odors of other substances. In addition, people may have different reactions to the same odor and in fact an odor that is offensive to one person may be perfectly acceptable to another (e.g., fast food restaurant). It is important to also note that an unfamiliar odor is more easily detected and is more likely to cause complaints than a familiar one. This is because of the phenomenon known as odor fatigue, in which a person can become desensitized to almost any odor and recognition only occurs with an alteration in the intensity.

Quality and intensity are two properties present in any odor. The quality of an odor indicates the nature of the smell experience. For instance, if a person describes an odor as flowery or sweet, then the person is describing the quality of the odor. Intensity refers to the strength of the odor. For example, a person may use the word strong to describe the intensity of an odor. Odor intensity depends on the odorant concentration in the air. When an odorous sample is progressively diluted, the odorant concentration decreases. As this occurs, the odor intensity weakens and eventually becomes so low that the detection or recognition of the odor is quite difficult. At some point during dilution, the concentration of the odorant reaches a detection threshold. An odorant concentration below the detection threshold means that the concentration in the air is not detectable by the average human.

Neither the state nor the federal governments have adopted rules or regulations for the control of odor sources. The SJVAPCD does not have an individual rule or regulation that specifically addresses odors; however, odors would be subject to SJVAPCD *Rule 4102, Nuisance*. Any actions related to odors would be based on citizen complaints to local governments and the SJVAPCD.

Toxic Air Contaminants

Toxic air contaminants (TACs) are air pollutants that may cause or contribute to an increase in mortality or serious illness, or which may pose a hazard to human health. TACs are usually present in minute quantities in the ambient air, but due to their high toxicity, they may pose a threat to public health even at very low concentrations. Because there is no threshold level below which adverse health impacts are not expected to occur, TACs differ from criteria pollutants for which acceptable levels of exposure can be determined and for which state and federal governments have set ambient air quality standards. TACs, therefore, are not considered "criteria pollutants" under either the FCAA or the California Clean Air Act (CCAA), and are thus not subject to National or California ambient air quality standards (NAAQS and CAAQS, respectively). Instead, the U.S. EPA and the ARB regulate Hazardous Air Pollutants (HAPs) and TACs, respectively, through statutes and regulations that generally require the use of the maximum or best available control technology to limit emissions. In conjunction with SJVAPCD rules, these federal and state statutes and regulations establish the regulatory framework for TACs. At the national levels, the U.S. EPA has established National Emission Standards for HAPs (NESHAPs), in accordance with the requirements of the FCAA and subsequent amendments. These are technology-based source-specific regulations that limit allowable emissions of HAPs.

Within California, TACs are regulated primarily through the Tanner Air Toxics Act (AB 1807) and the Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588). The Tanner Act sets forth a formal procedure for ARB to designate substances as TACs. The following provides a summary of the primary TACs of concern within the State of California and related health effects:

Diesel Particulate Matter (DPM) was identified as a TAC by the ARB in August 1998. DPM is emitted from both mobile and stationary sources. In California, on-road diesel-fueled vehicles contribute approximately 40% of the statewide total, with an additional 57 percent attributed to other mobile sources such as construction and mining equipment, agricultural equipment, and transport refrigeration units. Stationary sources, contributing about 3 percent of emissions, include shipyards, warehouses, heavy equipment repair yards, and oil and gas production operations. Emissions from these sources are from diesel-fueled internal combustion engines. Stationary sources that report DPM emissions also include heavy construction, manufacturers of asphalt paving materials and blocks, and diesel-fueled electrical generation facilities (ARB 2013).

In October 2000, the ARB issued a report entitled: "Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles", which is commonly referred to as the Diesel Risk Reduction Plan (DRRP). The DRRP provides a mechanism for combating the DPM problem. The goal of the DRRP is to reduce concentrations of DPM by 85 percent by the year 2020, in comparison to year 2000 baseline emissions. The key elements of the DRRP are to clean up existing engines through engine retrofit emission control devices, to adopt stringent standards for new diesel engines, and to lower the sulfur content of diesel fuel to protect new, and very effective, advanced technology emission control devices on diesel engines. When fully implemented, the DRPP will significantly reduce emissions from both old and new diesel fueled motor vehicles and from stationary sources that burn diesel fuel. In addition to these strategies, the ARB continues to promote the use of alternative fuels and electrification. As a result of these actions, DPM concentrations and associated health risks in future years are projected to decline (ARB 2013, ARB 2000).

Exposure to DPM can have immediate health effects. DPM can irritate the eyes, nose, throat, and lungs, and it can cause coughs, headaches, lightheadedness, and nausea. In studies with human volunteers, Exposure to DPM also causes inflammation in the lungs, which may aggravate chronic respiratory symptoms and increase the frequency or intensity of asthma attacks. The elderly and people with emphysema, asthma, and chronic heart and lung disease are especially sensitive to fine-particle pollution. Because children's lungs and respiratory systems are still developing, they are also more susceptible than healthy adults to fine particles. Exposure to fine particles is associated with increased frequency of childhood illnesses and can also reduce lung function in children. In California, DPM has been identified as a carcinogen.

Acetaldehyde is a federal hazardous air pollutant. The ARB identified acetaldehyde as a TAC in April 1993. Acetaldehyde is both directly emitted into the atmosphere and formed in the atmosphere as a result of photochemical oxidation. Sources of acetaldehyde include emissions from combustion processes such as exhaust from mobile sources and fuel combustion from stationary internal combustion engines, boilers, and process heaters. A majority of the statewide acetaldehyde emissions can be attributed to mobile sources, including on-road motor vehicles, construction and mining equipment, aircraft, recreational boats, and agricultural equipment. Area sources of emissions include the burning of wood in residential fireplaces and wood stoves. The primary stationary sources of acetaldehyde are from fuel combustion from the petroleum industry (ARB 2013).

Acute exposure to acetaldehyde results in effects including irritation of the eyes, skin, and respiratory tract. Symptoms of chronic intoxication of acetaldehyde resemble those of alcoholism. The U.S. EPA has classified acetaldehyde as a probable human carcinogen. In California, acetaldehyde was classified on April 1, 1988, as a chemical known to the state to cause cancer (U.S. EPA 2014; ARB 2013).

Benzene is highly carcinogenic and occurs throughout California. The ARB identified benzene as a TAC in January 1985. A majority of benzene emitted in California (roughly 88 percent) comes from motor vehicles, including evaporative leakage and unburned fuel exhaust. These sources include on-road motor vehicles, recreational boats, off-road recreational vehicles, and lawn and garden equipment. Benzene is also formed as a partial combustion product of larger aromatic fuel components. To a lesser extent, industry-related stationary sources are also sources of benzene emissions. The primary stationary sources of reported benzene emissions are crude petroleum and natural gas mining, petroleum refining, and electric generation that involves the use of petroleum products. The primary area sources include residential combustion of various types such as cooking and water heating (ARB 2013).

Acute inhalation exposure of humans to benzene may cause drowsiness, dizziness, headaches, as well as eye, skin, and respiratory tract irritation, and, at high levels, unconsciousness. Chronic inhalation exposure has caused various disorders in the blood, including reduced numbers of red blood cells and aplastic anemia, in occupational settings. Reproductive effects have been reported for women exposed by inhalation to high levels, and adverse effects on the developing fetus have been observed in animal tests. Increased incidences of leukemia (cancer of the tissues that form white blood cells) have been observed in humans occupationally exposed to benzene. The U.S. EPA has classified benzene as known human carcinogen for all routes of exposure (U.S. EPA 2014).

1,3-butadiene was identified by the ARB as a TAC in 1992. Most of the emissions of 1,3-butadiene are from incomplete combustion of gasoline and diesel fuels. Mobile sources account for a majority of the total statewide emissions. Additional sources include agricultural waste burning, open burning associated with forest management, petroleum refining, manufacturing of synthetics and man-made materials, and oil and gas extraction. The primary natural sources of 1,3-butadiene emissions are wildfires (ARB 2013).

Acute exposure to 1,3-butadiene by inhalation in humans results in irritation of the eyes, nasal passages, throat, and lungs. Epidemiological studies have reported a possible association between 1,3-butadiene exposure and cardiovascular diseases. Epidemiological studies of workers in rubber plants have shown an association between 1,3-butadiene exposure and increased incidence of leukemia. Animal studies have reported tumors at various sites from 1,3-butadiene exposure. In California, 1,3-butadiene has been identified as a carcinogen.

Carbon Tetrachloride was identified by the ARB as a TAC in 1987 under California's TAC program (ARB 2013). The primary stationary sources reporting emissions of carbon tetrachloride include chemical and allied product manufacturers and petroleum refineries. In the past, carbon tetrachloride was used for dry cleaning and as a grain-fumigant. Usage for these purposes is no longer allowed in the United States. Carbon tetrachloride has not been registered for pesticidal use in California since 1987. Also, the use of carbon tetrachloride in products to be used indoors has been discontinued in the United States. The statewide emissions of carbon tetrachloride are small (about 1.96 tons per year), and background concentrations account for most of the health risk (ARB 2013).

The primary effects of carbon tetrachloride in humans are on the liver, kidneys, and central nervous system. Human symptoms of acute inhalation and oral exposures to carbon tetrachloride include headache, weakness, lethargy, nausea, and vomiting. Acute exposures to higher levels and chronic (long-term) inhalation or oral exposure to carbon tetrachloride produces liver and kidney damage in humans. Human data on the carcinogenic effects of carbon tetrachloride are limited. Studies in animals have shown that ingestion of carbon tetrachloride increases the risk of liver cancer. In California, carbon tetrachloride has been identified as a carcinogen.

Hexavalent chromium was identified as a TAC in 1986. Sources of Hexavalent chromium include industrial metal finishing processes, such as chrome plating and chromic acid anodizing, and firebrick lining of glass furnaces. Other sources include mobile sources, including gasoline motor vehicles, trains, and ships (ARB 2013).

The respiratory tract is the major target organ for hexavalent chromium toxicity, for acute and chronic inhalation exposures. Shortness of breath, coughing, and wheezing were reported from a case of acute exposure to hexavalent chromium, while perforations and ulcerations of the septum, bronchitis, decreased pulmonary function, pneumonia, and other respiratory effects have been noted from chronic exposure. Human studies have clearly established that inhaled hexavalent chromium is a human carcinogen, resulting in an increased risk of lung cancer. In California, hexavalent chromium has been identified as a carcinogen.

Para-Dichlorobenzene was identified by the ARB as a TAC in April 1993. The primary area-wide sources that have reported emissions of para-dichlorobenzene include consumer products such as non-aerosol insect repellants and solid/gel air fresheners. These sources contribute nearly all of the statewide para-dichlorobenzene emissions (ARB 2013).

Acute exposure to paradichlorobenzene via inhalation results in irritation to the eyes, skin, and throat in humans. In addition, long-term inhalation exposure may affect the liver, skin, and central nervous system in humans. The U.S. EPA has classified para-dichlorobenzene as a possible human carcinogen.

Formaldehyde was identified by the ARB as a TAC in 1992. Formaldehyde is both directly emitted into the atmosphere and formed in the atmosphere as a result of photochemical oxidation. Photochemical oxidation is the largest source of formaldehyde concentrations in California ambient air. Directly emitted formaldehyde is a product of incomplete combustion. One of the primary sources of directly-emitted formaldehyde is vehicular exhaust. Formaldehyde is also used in resins, can be found in many consumer products as an antimicrobial agent, and is also used in fumigants and soil disinfectants. The primary area sources of formaldehyde emissions include wood burning in residential fireplaces and wood stoves (ARB 2013).

Exposure to formaldehyde may occur by breathing contaminated indoor air, tobacco smoke, or ambient urban air. Acute and chronic inhalation exposure to formaldehyde in humans can result in respiratory symptoms, and eye, nose, and throat irritation. Limited human studies have reported an association between formaldehyde exposure and lung and nasopharyngeal cancer. Animal inhalation studies have reported an increased incidence of nasal squamous cell cancer. Formaldehyde is classified as a probable human carcinogen.

Methylene Chloride was identified by the ARB as a TAC in 1987. Methylene chloride is used as a solvent, a blowing and cleaning agent in the manufacture of polyurethane foam and plastic fabrication, and as a solvent in paint stripping operations. Paint removers account for the largest use of methylene chloride in California, where methylene chloride is the main ingredient in many paint stripping formulations. Plastic product manufacturers, manufacturers of synthetics, and aircraft and parts manufacturers are stationary sources reporting emissions of methylene chloride (ARB 2013).

The acute effects of methylene chloride inhalation in humans consist mainly of nervous system effects including decreased visual, auditory, and motor functions, but these effects are reversible once exposure ceases. The effects of chronic exposure to methylene chloride suggest that the central nervous system is a potential target in humans and animals. Human data are inconclusive regarding methylene chloride and cancer. Animal studies have shown increases in liver and lung cancer and benign mammary gland tumors following the inhalation of methylene chloride. In California, methylene chloride has been identified as a carcinogen.

Perchloroethylene was identified by the ARB as a TAC in 1991. Perchloroethylene is used as a solvent, primarily in dry cleaning operations. Perchloroethylene is also used in degreasing operations, paints and coatings, adhesives, aerosols, specialty chemical production, printing inks, silicones, rug shampoos, and laboratory solvents. In California, the stationary sources that have reported emissions of perchloroethylene are dry cleaning plants, aircraft part and equipment manufacturers, and fabricated metal product manufacturers. The primary area sources include consumer products such as automotive brake cleaners and tire sealants and inflators (ARB 2013).

Acute inhalation exposure to perchloroethylene vapors can result in irritation of the upper respiratory tract and eyes, kidney dysfunction, and at lower concentrations, neurological effects, such as reversible mood and behavioral changes, impairment of coordination, dizziness, headaches sleepiness, and unconsciousness. Chronic inhalation exposure can result in neurological effects, including sensory symptoms such as headaches, impairments in cognitive and motor neurobehavioral functioning, and color vision decrements. Cardiac arrhythmia, liver damage, and possible kidney damage may also occur. In California, perchloroethylene has been identified as a carcinogen.

Land Use Compatibility with TAC Emission Sources

The ARB published an informational guide entitled: *Air Quality and Land Use Handbook: A Community Health Perspective* (Handbook) in 2005. The purpose of this guide is to provide information to aid local jurisdictions in addressing issues and concerns related to the placement of sensitive land uses near major sources of air pollution. The ARB's Handbook includes recommended separation distances for various land uses that are based on relatively conservative estimations of emissions based on source-specific information. However, these recommendations are not site specific and should not be interpreted as defined "buffer zones". It is also important to note that the recommendations of the Handbook are advisory and need to be balanced with other state and local policies (ARB 2005). Depending on site and project-specific conditions, an assessment of potential increases in exposure to TACs may be warranted for proposed development projects located within the distances identified. CARB-recommended separation distances for various sources of emissions are summarized in Table 1.

ASBESTOS

Asbestos is a term used for several types of naturally-occurring fibrous minerals found in many parts of California. The most common type of asbestos is chrysotile, but other types are also found in California. Serpentine rock often contains chrysotile asbestos. Serpentine rock, and its parent material, ultramafic rock, is abundant in the Sierra foothills, the Klamath Mountains, and Coast Ranges. The project site, however, is not located in an area of known ultramafic rock.

Asbestos is commonly found in ultramafic rock, including serpentine, and near fault zones. The amount of asbestos that is typically present in these rocks range from less than 1 percent up to about 25 percent, and sometimes more. Asbestos is released from ultramafic and serpentine rock when it is broken or crushed. This can happen when cars drive over unpaved roads or driveways which are surfaced with these rocks, when land is graded for building purposes, or at quarrying operations. It is also released naturally through weathering and erosion. Once released from the rock, asbestos can become airborne and may stay in the air for long periods of time.

Table 1
Recommendations on Siting New Sensitive Land Uses Near Air Pollutant Sources

Source Category	Advisory Recommendations
Freeways and High-Traffic Roads	• Avoid siting new sensitive land uses within 500 feet of a freeway, urban roads with 100,000 vehicles/day, or rural roads with 50,000 vehicles/day.
Distribution Centers	• Avoid siting new sensitive land uses within 1,000 feet of a distribution center (that accommodates more than 100 trucks per day, more than 40 trucks with operating transport refrigeration units (TRUs) per day, or where TRU unit operations exceed 300 hours per week). • Take into account the configuration of existing distribution centers and avoid locating residences and other new sensitive land uses near entry and exit points.
Rail Yards	• Avoid siting new sensitive land uses within 1,000 feet of a major service and maintenance rail yard. • Within one mile of a rail yard, consider possible siting limitations and mitigation approaches.
Ports	• Avoid siting of new sensitive land uses immediately downwind of ports in the most heavily impacted zones. Consult local air districts or the ARB on the status of pending analyses of health risks.
Refineries	• Avoid siting new sensitive land uses immediately downwind of petroleum refineries. Consult with local air districts and other local agencies to determine an appropriate separation.
Chrome Platers	• Avoid siting new sensitive land uses within 1,000 feet of a chrome plater.
Dry Cleaners Using Perchloroethylene	• Avoid siting new sensitive land uses within 300 feet of any dry-cleaning operation. For operations with two or more machines, provide 500 feet. For operations with 3 or more machines, consult with the local air district. • Do not site new sensitive land uses in the same building with perchloroethylene dry cleaning operations.
Gasoline Dispensing Facilities	• Avoid siting new sensitive land uses within 300 feet of a large gas station (defined as a facility with a throughput of 3.6 million gallons per year or greater). A 50-foot separation is recommended for typical gas dispensing facilities.

Recommendations are advisory, are not site specific, and may not fully account for future reductions in emissions, including those resulting from compliance with existing/future regulatory requirements.
Source: ARB 2005

Additional sources of asbestos include building materials and other manmade materials. The most common sources are heat-resistant insulators, cement, furnace or pipe coverings, inert filler material, fireproof gloves and clothing, and brake linings. Asbestos has been used in the United States since the early 1900's; however, asbestos is no longer allowed as a constituent in most home products and materials. Many older buildings, schools, and homes still have asbestos containing products.

Naturally-occurring asbestos was identified by ARB as a TAC in 1986. The ARB has adopted two statewide control measures which prohibits the use of serpentine or ultramafic rock for unpaved surfacing and controls dust emissions from construction, grading, and surface mining in areas with these rocks. Various other laws have also been adopted, including laws related to the control of asbestos-containing materials during the renovation and demolition of buildings.

All types of asbestos are hazardous and may cause lung disease and cancer. Health risks to people are dependent upon their exposure to asbestos. The longer a person is exposed to asbestos and the greater the intensity of the exposure, the greater the chances for a health problem. Asbestos-related disease, such as lung cancer, may not occur for decades after breathing asbestos fibers. Cigarette smoking increases the risk of lung cancer from asbestos exposure.

VALLEY FEVER

Valley fever is an infection caused by the fungus Coccidioides. The scientific name for valley fever is "coccidioidomycosis," and it's also sometimes called "desert rheumatism." The term "valley fever" usually refers to Coccidioides infection in the lungs, but the infection can spread to other parts of the body in severe cases.

Coccidioides spores circulate in the air after contaminated soil and dust are disturbed by humans, animals, or the weather. The spores are too small to see without a microscope. When people breathe in the spores, they are at risk for developing valley fever. After the spores enter the lungs, the person's body temperature allows the spores to change shape and grow into spherules. When the spherules get large enough, they break open and release smaller pieces (called endospores) which can then potentially spread within the lungs or to other organs and grow into new spherules. In extremely rare cases, the fungal spores can enter the skin through a cut, wound, or splinter and cause a skin infection.

Symptoms of valley fever may appear between 1 and 3 weeks after exposure. Symptoms commonly include: fatigue, coughing, fever, shortness of breath, headaches, night sweats, muscle aches and joint pain, and rashes on the upper body or legs.

Approximately 5 to 10 percent of people who get valley fever will develop serious or long-term problems in their lungs. In an even smaller percent of people (about 1 percent), the infection spreads from the lungs to other parts of the body, such as the central nervous system (brain and spinal cord), skin, or bones and joints. Certain groups of people may be at higher risk for developing the severe forms of valley fever, such as people who have weakened immune systems. The fungus that causes valley fever, Coccidioides, can't spread from the lungs between people or between people and animals. However, in extremely rare instances, a wound infection with Coccidioides can spread valley fever to someone else, or the infection can be spread through an organ transplant with an infected organ.

For many people, the symptoms of valley fever will go away within a few months without any treatment. Healthcare providers choose to prescribe antifungal medication for some people to try to reduce the severity of symptoms or prevent the infection from getting worse. Antifungal medication is typically given to people who are at higher risk for developing severe valley fever. The treatment typically occurs over a period of roughly 3 to 6 months. In some instances, longer treatment may be required. If valley fever develops into meningitis life-long antifungal treatment is typically necessary.

Scientists continue to study how weather and climate patterns affect the habitat of the fungus that causes valley fever. Coccidioides is thought to grow best in soil after heavy rainfall and then disperse into the air most effectively during hot, dry conditions. For example, hot and dry weather conditions have been shown to correlate with an increase in the number of valley fever cases in Arizona and in California. The ways in which climate change may be affecting the number of valley fever infections, as well as the geographic range of Coccidioides, isn't known yet, but is a subject for further research (CDC 2016).

REGULATORY FRAMEWORK

Air quality within the SJVAB is regulated by several jurisdictions including the U.S. EPA, ARB, and the SJVAPCD. Each of these jurisdictions develops rules, regulations, and policies to attain the goals or directives imposed upon them through legislation. Although U.S. EPA regulations may not be superseded, both state and local regulations may be more stringent.

FEDERAL

U.S. Environmental Protection Agency

At the federal level, the U.S. EPA has been charged with implementing national air quality programs. The U.S. EPA's air quality mandates are drawn primarily from the FCAA, which was signed into law in 1970. Congress substantially amended the FCAA in 1977 and again in 1990.

Federal Clean Air Act

The FCAA required the U.S. EPA to establish National Ambient Air Quality Standards (NAAQS), and also set deadlines for their attainment. Two types of NAAQS have been established: primary standards, which protect public health, and secondary standards, which protect public welfare from non-health-related adverse effects, such as visibility restrictions. NAAQS are summarized in Table 2.

Table 2
Summary of Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards	National Standards (Primary)
Ozone (O_3)	1-hour	0.09 ppm	–
	8-hour	0.070 ppm	0.070 ppm
Particulate Matter (PM_{10})	AAM	20 µg/m^3	–
	24-hour	50 µg/m^3	150 µg/m^3
Fine Particulate Matter ($PM_{2.5}$)	AAM	12 µg/m^3	12 µg/m^3
	24-hour	No Standard	35 µg/m^3
Carbon Monoxide (CO)	1-hour	20 ppm	35 ppm
	8-hour	9 ppm	9 ppm
	8-hour (Lake Tahoe)	6 ppm	–
Nitrogen Dioxide (NO_2)	AAM	0.030 ppm	53 ppb
	1-hour	0.18 ppm	100 ppb
Sulfur Dioxide (SO_2)	AAM	–	0.03 ppm
	24-hour	0.04 ppm	0.14 ppm
	3-hour	–	–
	1-hour	0.25 ppm	75 ppb
Lead	30-day Average	1.5 µg/m^3	–
	Calendar Quarter	–	1.5 µg/m^3
	Rolling 3-Month Average	–	0.15 µg/m^3
Sulfates	24-hour	25 µg/m^3	No Federal Standards
Hydrogen Sulfide	1-hour	0.03 ppm (42 µg/m^3)	
Vinyl Chloride	24-hour	0.01 ppm (26 µg/m^3)	
Visibility-Reducing Particle Matter	8-hour	Extinction coefficient: 0.23/kilometer-visibility of 10 miles or more (0.07-30 miles or more for Lake Tahoe) due to particles when the relative humidity is less than 70%.	

** For more information on standards visit : https://www.arb.ca.gov/research/aaqs/aaqs2.pdf*
Source: ARB 2018a

The FCAA also required each state to prepare an air quality control plan referred to as a State Implementation Plan (SIP). The FCAA Amendments of 1990 added requirements for states with nonattainment areas to revise their SIPs to incorporate additional control measures to reduce air pollution. The SIP is periodically modified to reflect the latest emissions inventories, planning documents, and rules and regulations of the air basins as reported by their jurisdictional agencies. The U.S. EPA has responsibility to review all state SIPs to determine conformance with the mandates of the FCAA, and the amendments thereof, and determine if implementation will achieve air quality goals. If the U.S. EPA determines a SIP to be inadequate, a Federal Implementation Plan (FIP) may be prepared for the nonattainment area that imposes additional control measures.

Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) first authorized the U.S. EPA to regulate asbestos in schools and Public and Commercial buildings under Title II of the law, which is also known as the Asbestos Hazard Emergency Response Act (AHERA). AHERA requires Local Education Agencies (LEAs) to inspect their schools for ACBM and prepare management plans to reduce the asbestos hazard. The Act also established a program for the training and accreditation of individuals performing certain types of asbestos work.

Asbestos School Hazard Abatement and Reauthorization Act

The Asbestos School Hazard Abatement and Reauthorization Act (ASHARA) reauthorized AHERA and made some minor changes in the Act. It also reauthorized the Asbestos School Hazard Abatement Act.

Asbestos School Hazard Abatement Act

The Asbestos School Hazard Abatement Act (ASHAA) of 1984 provided loans and grants to help financially needy public and private schools correct serious asbestos hazards. This program was funded from 1985 until 1993. There have been no funds appropriated since that date.

National Emission Standards for Hazardous Air Pollutants

Pursuant to the FCAA of 1970, the U.S. EPA established the National Emission Standards for Hazardous Air Pollutants. These are technology-based source-specific regulations that limit allowable emissions of HAPs.

STATE

California Air Resources Board

The ARB is the agency responsible for coordination and oversight of state and local air pollution control programs in California and for implementing the California Clean Air Act of 1988. Other ARB duties include monitoring air quality (in conjunction with air monitoring networks maintained by air pollution control districts and air quality management districts, establishing California Ambient Air Quality Standards (CAAQS), which in many cases are more stringent than the NAAQS, and setting emissions standards for new motor vehicles. The CAAQS are summarized in Table 2. The emission standards established for motor vehicles differ depending on various factors including the model year, and the type of vehicle, fuel and engine used.

California Clean Air Act

The CCAA requires that all air districts in the state endeavor to achieve and maintain CAAQS for Ozone, CO, SO_2, and NO_2 by the earliest practical date. The CCAA specifies that districts focus particular attention on reducing the emissions from transportation and area-wide emission sources, and the act provides districts with authority to regulate indirect sources. Each district plan is required to either (1) achieve a five percent annual reduction, averaged over consecutive 3-year periods, in district-wide emissions of each non-attainment pollutant or its precursors, or (2) to provide for implementation of all feasible measures to reduce emissions. Any planning effort for air quality attainment would thus need to consider both state and federal planning requirements.

California Assembly Bill 170

Assembly Bill 170, Reyes (AB 170), was adopted by state lawmakers in 2003 creating Government Code Section 65302.1 which requires cities and counties in the San Joaquin Valley to amend their general plans to include data and analysis, comprehensive goals, policies and feasible implementation strategies designed to improve air quality.

Assembly Bills 1807 & 2588 - Toxic Air Contaminants

Within California, TACs are regulated primarily through AB 1807 (Tanner Air Toxics Act) and AB 2588 (Air Toxics Hot Spots Information and Assessment Act of 1987). The Tanner Air Toxics Act sets forth a formal procedure for ARB to designate substances as TACs. This includes research, public participation, and scientific peer review before ARB designates a substance as a TAC. Existing sources of TACs that are subject to the Air Toxics Hot Spots Information and Assessment Act are required to: (1) prepare a toxic emissions inventory; (2) prepare a risk assessment if emissions are significant; (3) notify the public of significant risk levels; and (4) prepare and implement risk reduction measures.

Regulations Related to Schools

The State of California has adopted various regulations and programs intended to reduce exposure of children to air pollutant concentrations, including the following:

Toxic Emissions Near Schools Program (AB 3205/SB 352)

Assembly Bill (AB) 3205 (Health and Safety Code Sections 42301.6–42301.9) addresses stationary sources of TACs near schools. It also requires public notice to the parents or guardians of children enrolled in any school located within one-quarter mile of the source and to each address within a 1,000-foot radius of a TAC source. Senate Bill (SB) 352 (Education Code Section 17213, Public Resources Code Section 21151.8) expands previous requirements to review sources of TACs near school sites. SB 352 directs school districts to include in the school site analysis any emissions sources, including, but not limited to, freeways and other busy traffic corridors, large agricultural operations, and rail yards within one-quarter mile of a school site. SB 352 requires that any school site located within 500 feet of the edge of the closest travel lane of a freeway or other busy traffic corridor be reviewed for potential health risks.

California Air Resources Board's Truck and Bus Regulation

This regulation requires fleets that operate in California to reduce diesel truck and bus emissions by retrofitting or replacing existing engines. Amendments were adopted in December 2010 to provide more time for fleets to comply. The amended regulation required installation of PM retrofits beginning January 1, 2012 and replacement of older trucks starting January 1, 2015. By January 1, 2023, nearly all vehicles would need to have 2010 model year engines or equivalent.

The regulation applies to nearly all privately and federally owned diesel fueled trucks and buses and privately and publicly owned school buses with a gross vehicle weight rating greater than 14,000 pounds. The regulation has provisions to provide extra credit for PM filters installed prior to July 2011, has delayed requirements for fleets with 3 or fewer vehicles, provisions for agricultural vehicles and other situations.

Lower-Emission School Bus Program 2007

Proposition 1B, which was approved by the voters on November 7th, 2006, enacts the Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006. This bond act authorizes $200 million for replacing and retrofitting school buses. The primary goal of the ARB's Lower-Emission School Bus Program is to reduce school children's exposure to both cancer-causing and smog-forming pollution. The program provides grant funding for new, safer school buses and to put air pollution control equipment (i.e., retrofit devices) on buses that are already on the road.

Airborne Toxic Control Measure to Limit School Bus Idling at Schools

ARB has approved an airborne toxic control measure (ATCM) that limits school bus idling and idling at or near schools to only when necessary for safety or operational concerns. The ATCM requires a driver of a school bus or vehicle, transit bus, or other commercial motor vehicle to manually turn off the bus or vehicle engine upon arriving at a school and to restart no more than 30 seconds before departing. A driver of a school bus or vehicle is subject to the same requirement when operating within 100 feet of a school and is prohibited from idling more than five minutes at each stop beyond schools, such as parking or maintenance facilities, school bus stops, or school activity destinations. A driver of a transit bus or other commercial motor vehicle is prohibited from idling more than five minutes at each stop within 100 feet of a school. Idling necessary for health, safety, or operational concerns is exempt from these restrictions. In addition, the ATCM requires a motor carrier of an affected bus or vehicle to: ensure that drivers are informed of the idling requirements, track complaints and enforcement actions, and keep records of these driver education and tracking activities. This ATCM became effective in July 2003.

SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

The SJVAPCD is the agency primarily responsible for ensuring that NAAQS and CAAQS are not exceeded and that air quality conditions are maintained in the SJVAB, within which the proposed project is located. Responsibilities of the SJVAPCD include, but are not limited to, preparing plans for the attainment of ambient air quality standards, adopting and enforcing rules and regulations concerning sources of air pollution, issuing permits for stationary sources of air pollution, inspecting stationary sources of air pollution and responding to citizen complaints, monitoring ambient air quality and meteorological conditions, and implementing programs and regulations required by the FCAA and the CCAA. The SJVAPCD Rules and Regulations that are applicable to the proposed project include, but are not limited to, the following:

- *Regulation VIII (Fugitive Dust Prohibitions). Regulation VIII (Rules 8011-8081).* This regulation is a series of rules designed to reduce particulate emissions generated by human activity, including construction and demolition activities, carryout and trackout, paved and unpaved roads, bulk material handling and storage, unpaved vehicle/traffic areas, open space areas, etc.
- *Rule 4002 (National Emissions Standards for Hazardous Air Pollutants).* This rule may apply to projects in which portions of an existing building would be renovated, partially demolished or removed. With regard to asbestos, the NESHAP specifies work practices to be followed during renovation, demolition or other abatement activities when friable asbestos is involved. Prior to demolition activity, an asbestos survey of the existing structure may be required to identify the presence of any asbestos containing building materials (ACBM). Removal of identified ACBM must be removed by a certified asbestos contractor in accordance with CAL-OSHA requirements.
- *Rule 4102 (Nuisance).* Applies to any source operation that emits or may emit air contaminants or other materials.
- *Rule 4103 (Open Burning).* This rule regulates the use of open burning and specifies the types of materials that may be open burned. Section 5.1 of this rule prohibits the burning of trees and other vegetative (non-agricultural) material whenever the land is being developed for non-agricultural purposes.
- *Rule 4601 (Architectural Coatings).* Limits volatile organic compounds from architectural coatings.
- *Rule 4641 (Cutback, Slow Cure, and Emulsified Asphalt, Paving and Maintenance Operations).* This rule applies to the manufacture and use of cutback, slow cure, and emulsified asphalt during paving and maintenance operations.
- *Rule 9510 (Indirect Source Review - ISR).* Requires developers of larger residential, commercial, recreational, and industrial projects to reduce smog-forming and particulate emissions from their projects' baselines. If project emissions still exceed the minimum baseline reductions, a project's developer will be required to mitigate the difference by paying an off-site fee to the District, which would then be used to fund clean-air projects. For projects subject to this rule, the ISR rule requires

developers to mitigate and/or offset emissions sufficient to achieve: (1) 20-percent reduction of construction equipment exhaust NOx; (2) 45-percent reduction of construction equipment exhaust PM_{10}; (3) 33-percent reduction of operational NOx over 10 years; and (4) 50-percent reduction of operational PM_{10} over 10 years. SJVAPCD ISR applications must be filed "no later than applying for a final discretionary approval with a public agency."

REGULATORY ATTAINMENT DESIGNATIONS

Under the CCAA, ARB is required to designate areas of the state as attainment, nonattainment, or unclassified with respect to applicable standards. An "attainment" designation for an area signifies that pollutant concentrations did not violate the applicable standard in that area. A "nonattainment" designation indicates that a pollutant concentration violated the applicable standard at least once, excluding those occasions when a violation was caused by an exceptional event, as defined in the criteria. Depending on the frequency and severity of pollutants exceeding applicable standards, the nonattainment designation can be further classified as serious nonattainment, severe nonattainment, or extreme nonattainment, with extreme nonattainment being the most severe of the classifications. An "unclassified" designation signifies that the data does not support either an attainment or nonattainment designation. The CCAA divides districts into moderate, serious, and severe air pollution categories, with increasingly stringent control requirements mandated for each category.

The U.S. EPA designates areas for ozone, CO, and NO_2 as "does not meet the primary standards," "cannot be classified," or "better than national standards." For SO_2, areas are designated as "does not meet the primary standards," "does not meet the secondary standards," "cannot be classified," or "better than national standards." However, ARB terminology of attainment, nonattainment, and unclassified is more frequently used. The U.S. EPA uses the same sub-categories for nonattainment status: serious, severe, and extreme. In 1991, U.S. EPA assigned new nonattainment designations to areas that had previously been classified as Group I, II, or III for PM_{10} based on the likelihood that they would violate national PM_{10} standards. All other areas are designated "unclassified."

The state and national attainment status designations pertaining to the SJVAB are summarized in Table 3. The SJVAB is currently designated as a nonattainment area with respect to the state PM_{10} standard, ozone, and $PM_{2.5}$ standards. The SJVAB is designated nonattainment for the national 8-hour ozone and $PM_{2.5}$ standards. On September 25, 2008, the U.S. EPA redesignated the San Joaquin Valley to attainment for the PM_{10} NAAQS and approved the PM_{10} Maintenance Plan (SJVAPCD 2018).

Table 3
SJVAB Attainment Status Designations

Pollutant	National Designation	State Designation
Ozone, 1 hour	No Standard	Nonattainment/Severe
Ozone, 8 hour	Nonattainment/Extreme	Nonattainment
PM_{10}	Attainment	Nonattainment
$PM_{2.5}$	Nonattainment	Nonattainment
Carbon Monoxide	Attainment	Unclassified/Attainment
Nitrogen dioxide	Unclassified/Attainment	Attainment
Sulfur dioxide	Unclassified/Attainment	Attainment
Lead (particulate)	No Designation/Classification	Attainment
Hydrogen sulfide	No Federal Standard	Unclassified
Sulfates	No Federal Standard	Attainment
Visibility-reducing particulates	No Federal Standard	Unclassified
Vinyl Chloride	No Federal Standard	Attainment

Source: SJVAPCD 2018

AMBIENT AIR QUALITY

Air pollutant concentrations are measured at several monitoring stations in Fresno County. The Clovis-N. Villa Monitoring Station is the closest representative monitoring site to the proposed project site with sufficient data to meet U.S. EPA and/or ARB criteria for quality assurance. This monitoring station monitors ambient concentrations of ozone, nitrogen dioxide, PM_{10}, and $PM_{2.5}$. Ambient monitoring data was obtained for the last three years of available measurement data (i.e., 2014 through 2016) and are summarized in Table 4. As depicted, the state and national ozone, national $PM_{2.5}$, and state PM_{10} standards were exceeded on numerous occasions during the past 3 years. The state standards for PM_{10} have also been exceeded on various occasions during the past 3 years.

Table 4
Summary of Ambient Air Quality Monitoring Data[1]

	2014	2015	2016
Ozone			
Maximum concentration (1-hour/8-hour average)	0.118/0.103	0.116/0.098	0.113/0.095
Number of days state/national 1-hour standard exceeded	26/0	18/0	26/1
Number of days state/national 8-hour standard exceeded	84/82	51/50	63/62
Nitrogen Dioxide (NO_2)			
Maximum concentration (1-hour average)	59.0	59.0	49.8
Annual average	10	10	9
Number of days state/federal standard exceeded	0/0	0/0	0/0
Suspended Particulate Matter (PM_{10})			
Maximum concentration (state/national)	82.3	105.3	76.2
Number of days state standard exceeded (measured/calculated[2])	5/NA	8/50.3	10/61.3
Number of days national standard exceeded (measured/calculated[2])	0/0	0/0	0/0
Suspended Particulate Matter ($PM_{2.5}$)			
Maximum concentration (state/national)	72.8	80.7	50.4
Annual Average (state/national)	NA/16.6	13.0/14.9	11.6/12.5
Number of days national standard exceeded (measured/calculated[2])	26/40.4	14/15.4	8/8.2

ppm = parts per million by volume, μg/m³ = micrograms per cubic meter, NA=Not Available

1 *Ambient data was obtained from the Clovis-N. Villa Street Monitoring Station.*

2 *Measured days are those days that an actual measurement was greater than the standard. Calculated days are the estimated number of days that a measurement would have been greater than the level of the standard had measurements been collected every day.*

Source: ARB 2018b

SENSITIVE RECEPTORS

One of the most important reasons for air quality standards is the protection of those members of the population who are most sensitive to the adverse health effects of air pollution, termed "sensitive receptors." The term sensitive receptors refer to specific population groups, as well as the land uses where individuals would reside for long periods. Commonly identified sensitive population groups are children, the elderly, the acutely ill, and the chronically ill. Commonly identified sensitive land uses would include facilities that house or attract children, the elderly, people with illnesses, or others who are especially sensitive to the effects of air pollutants. Residential dwellings, schools, parks, playgrounds, childcare centers, convalescent homes, and hospitals are examples of sensitive land uses.

Sensitive land uses located in the vicinity of the proposed project site consist predominantly of rural residential land uses. The nearest residential land use is located west of the project site, across Fowler

Avenue. Residential land uses are also located approximately 420 feet to the north, 950 feet to the east, and 1,170 feet to the south. Nearby residential land uses are depicted in Figure 1.

IMPACTS & MITIGATION MEASURES

METHODOLOGY

Short-term Impacts

Short-term construction emissions associated with the proposed project were calculated using the CalEEMod computer program. Emissions were quantified for demolition, site preparation/grading, asphalt paving, facility construction, and application of architectural coatings. Detailed construction information, including construction schedules and equipment requirements, has not been identified for the proposed project. Default construction phases and equipment assumptions contained in the CalEEMod model were, therefore, relied upon for the calculation of construction-generated emissions. The import and export of soil is not anticipated to be required. As previously noted, an estimated date of project construction has not yet been identified. However, the District estimates that the school could be constructed within approximately five years. To be conservative, construction of the project was assumed to begin in 2018. Due to anticipated reductions in future fleet-average emission rates, emissions for post-year 2018 conditions would be less. Modeling assumptions and output files are included in Appendix A of this report.

Long-term Impacts

Long-term operational emissions of criteria air pollutants associated with the proposed project were calculated using the CalEEMod computer program. Modeling was conducted based on traffic data derived, in part, from the *traffic analysis prepared for the proposed project* (JLB 2018). Mobile source emissions were conservatively based on the default fleet distribution assumptions contained in the model. All other modeling assumptions were based on the default parameters contained in the CalEEMod computer model. Modeling assumptions and output files are included in Appendix A of this report. Localized concentrations of TACs, mobile-source CO, and odors were qualitatively assessed. As previously noted, an estimated date of project construction and opening date have not yet been identified. However, the District estimates that the school could be constructed within approximately five years. To be conservative, operation of the project was assumed to begin in 2020. Due to anticipated reductions in future fleet-average mobile-source and energy emission rates, emissions for post-year 2020 operational conditions would be less.

THRESHOLDS OF SIGNIFICANCE

To assist local jurisdictions in the evaluation of air quality impacts, the SJVAPCD has published the Guide for Assessing and Mitigating Air Quality Impacts (SJVAPCD 2015). This guidance document includes recommended thresholds of significance to be used for the evaluation of short-term construction, long-term operational, odor, toxic air contaminant, and cumulative air quality impacts. Accordingly, the SJVAPCD-recommended thresholds of significance are used to determine whether implementation of the proposed project would result in a significant air quality impact. The thresholds of significance are summarized below.

- Short-term Emissions—Construction impacts associated with the proposed project would be considered significant if project-generated emissions would exceed 100 tons per year (TPY) of CO, 10 TPY of ROG or NO_X, 27 TPY of SO_X, or 15 TPY of PM_{10} or $PM_{2.5}$.
- Long-term Emissions—Operational impacts associated with the proposed project would be considered significant if project generated emissions would exceed 100 tons per year (TPY) of CO, 10 TPY of ROG or NO_X, 27 TPY of SO_X, or 15 TPY of PM_{10} or $PM_{2.5}$.
- Conflict with or Obstruct Implementation of Applicable Air Quality Plan—Due to the region's non-attainment status for ozone, $PM_{2.5}$, and PM_{10}, if project-generated emissions of ozone precursor pollutants (i.e., ROG and NO_x) or PM would exceed the SJVAPCD's significance thresholds, then the project would be considered to conflict with the attainment plans.

- Local Mobile-Source CO Concentrations—Local mobile source impacts associated with the proposed project would be considered significant if the project contributes to CO concentrations at receptor locations in excess of the CAAQS (i.e., 9.0 ppm for 8 hours or 20 ppm for 1 hour).
- Exposure to toxic air contaminants (TAC) would be considered significant if the probability of contracting cancer for the Maximally Exposed Individual (i.e., maximum individual risk) would exceed 20 in 1 million or would result in a Hazard Index greater than 1.
- Odor impacts associated with the proposed project would be considered significant if the project has the potential to frequently expose members of the public to objectionable odors.

In addition to the above thresholds, the SJVAPCD also recommends the use of daily emissions thresholds for the evaluation of project impacts on localized ambient air quality conditions. Accordingly, the proposed project would also be considered to result in a significant contribution to localized ambient air quality if on-site emissions or ROG, NO_X, PM_{10}, $PM_{2.5}$, CO, or SO_2 associated with either short-term construction or long-term operational activities would exceed a daily average of 100 pounds per day (lbs/day) for each of the pollutants evaluated (SJVAPCD 2015).

PROJECT IMPACTS

Impact AQ-A.	***Would the project conflict with or obstruct implementation of the applicable air quality plan?***

In accordance with SJVAPCD-recommended methodology for the assessment of air quality impacts, projects that result in significant air quality impacts at the project level are also considered to have a significant cumulative air quality impact. As noted in Impact AQ-B, short-term construction and long-term operational emissions would not exceed applicable thresholds. In addition, the proposed project's contribution to localized concentrations of emissions, including emissions of CO, TACs, and odors, are considered less than significant. However, as noted in Impact AQ-D, the proposed project could result in a significant contribution to localized PM concentrations for which the SJVAB is currently designated non-attainment. For this reason, implementation of the proposed project could conflict with air quality attainment or maintenance planning efforts. This impact would be considered ***potentially significant***.

Mitigation Measure: Implement Mitigation Measure AQ-1 (refer to Impact AQ-D).

Significance after Mitigation: With implementation of Mitigation Measure AQ-1 this impact would be considered less than significant.

Impact AQ-B.	***Would the project violate any air quality standard or contribute substantially to an existing or projected air quality violation?***

Short-term Construction Emissions

Short-term increases in emissions would occur during the construction process. Construction-generated emissions are of temporary duration, lasting only as long as construction activities occur, but have the potential to represent a significant air quality impact. The construction of the proposed project would result in the temporary generation of emissions associated with site grading and excavation, paving, motor vehicle exhaust associated with construction equipment and worker trips, as well as the movement of construction equipment on unpaved surfaces. Short-term construction emissions would result in increased emissions of ozone-precursor pollutants (i.e., ROG and NO_X) and emissions of PM. Emissions of ozone-precursors would result from the operation of on-road and off-road motorized vehicles and equipment. Emissions of airborne PM are largely dependent on the amount of ground disturbance associated with site preparation activities and can result in increased concentrations of PM that can adversely affect nearby sensitive land uses. Estimated construction-generated annual emissions associated with the proposed project alternatives are summarized in Table 5.

As noted in Table 5, construction of the proposed project would generate maximum uncontrolled annual emissions of approximately 0.7 tons/year of ROG, 3.0 tons/year of NO_x, 2.5 tons/year of CO, 0.4 tons/year of PM_{10}, and 0.2 tons/year of $PM_{2.5}$. Emissions of SO_2 would be negligible (e.g., less than 0.1 tons/year). Estimated construction-generated emissions would not exceed the SJVAPCD's significance thresholds of 10 tons/year of ROG, 10 tons/year of NO_x, or 15 tons/year PM_{10}.

Table 5
Annual Construction Emissions

Construction Phase	Uncontrolled Maximum Annual Emissions (TPY) [1]					
	ROG	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$
Construction Year 1						
Demolition	< 0.1	0.4	0.2	< 0.1	< 0.1	< 0.1
Site Preparation	0	0.2	0.1	< 0.1	0.1	0.1
Grading	0.1	1.1	0.6	< 0.1	0.2	< 0.1
Building Construction	0.1	0.7	0.5	< 0.1	0.1	< 0.1
Total:	0.2	2.4	1.4	< 0.1	0.4	0.2
Construction Year 2						
Building Construction	0.3	2.8	2.2	< 0.1	0.2	0.1
Paving	< 0.1	0.2	0.2	< 0.1	< 0.1	< 0.1
Architectural Coating	0.4	0.1	0.1	< 0.1	< 0.1	< 0.1
Total:	0.7	3.0	2.5	< 0.1	0.2	0.1
Maximum Annual Emissions:	0.7	3.0	2.5	< 0.1	0.4	0.2
Significance Thresholds:	*10*	*10*	*None*	*None*	*15*	*15*
Exceeds Thresholds/Significant Impact?:	*No*	*No*	*No*	*No*	*No*	*No*

1. Based on CalEEMod computer modeling. Totals may not sum due to rounding. Does not include emission control measures. Construction start date has not yet been identified. To be conservative, emissions modeling assumes construction could begin in 2018. Future year emissions would be less.
Refer to Appendix A for modeling results and assumptions.

Estimated daily on-site construction emissions are summarized in Table 6. As noted in Table 6, construction of the proposed project would generate maximum uncontrolled on-site emissions of approximately 16 lbs/day of ROG, 78 lbs/day of NO_x, 46 lbs/day of CO, 20 lbs/day of PM_{10}, and 12 lbs/day of $PM_{2.5}$. Emissions of SO_2 would be negligible (e.g., less than 0.1 tons/year). Daily on-site construction emissions would not exceed the SJVAPCD's recommended localized ambient air quality significance thresholds of 100 lbs/day for each of the criteria air pollutants evaluated.

Short-term construction of the proposed project would not result in a significant impact to regional or local air quality conditions. Furthermore, it is important to note that the proposed project would be required to comply with SJVPACD Regulation VIII (Fugitive PM_{10} Prohibitions). Mandatory compliance with SJVAPCD Regulation VIII would further reduce emissions of fugitive dust from the project site and minimize the project's potential to adversely affect nearby sensitive receptors. With compliance with SJVAPCD Regulation VIII, emissions of PM would be reduced by approximately 50 percent, or more. Given that project-generated emissions would not exceed applicable SJVAPCD significance thresholds, this impact would be considered ***less than significant***.

Table 6
Daily On-Site Construction Emissions

Construction Phase	Uncontrolled Daily Emissions (lbs/day) [1]					
	ROG	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$
Demolition	8	78	46	0	4	4
Site Preparation	4	48	22	0	20	12
Grading	5	63	34	0	11	6
Building Construction – Year 1	2	17	12	0	2	1
Building Construction – Year 2	3	28	22	0	2	1
Paving	2	15	15	0	1	1
Architectural Coating	11	3	3	0	0	0
Maximum Daily On-site Emissions:	16	78	46	0	20	12
Significance Thresholds:	*100*	*100*	*100*	*100*	*100*	*100*
Exceeds Thresholds/Significant Impact?:	*No*	*No*	*No*	*No*	*No*	*No*

1. Based on CalEEMod computer modeling. Totals may not sum due to rounding. Does not include emission control measures, including dust control per Regulation VIII.
2. Average daily on-site emissions are based on total on-site emissions divided by the total number of construction days.
3. Maximum daily on-site emissions assumes building construction, paving, and architectural coating application could potentially occur simultaneously.
Refer to Appendix A for modeling results and assumptions.

Long-term Operational Emissions

Estimated annual operational emissions for the proposed project are summarized in Table 7. As depicted, the proposed project would result in operational emissions of approximately 0.7 tons/year of ROG, 4.3 tons/year of NO_X, 3.3 tons/year of CO, 0.8 tons/year of PM_{10}, and 0.3 tons/year of $PM_{2.5}$ during the initial year of operation. Emissions of SO_2 would be negligible (i.e., less than 0.1 tons/year). Operational emissions would be projected to decline in future years, with improvements in fuel-consumption emissions standards. Operational emissions would not exceed SJVAPCD's mass-emissions significance thresholds.

Estimated average-daily on-site operational emissions are also summarized in Table 7. As noted, average-daily on-site operational emissions would be largely associated with area sources. Emissions would be largely associated with occasional landscape maintenance activities, as well as, evaporative ROG emissions associated with the application of architectural coatings and use of consumer products. Average-daily on-site emissions of ROG would total approximately 3 lbs/day. Average-daily on-site emissions of other pollutants would be negligible (i.e., less than 0.1 lbs/day). Average-daily on-site emissions would not exceed the SJVAPCD's recommended localized ambient air quality significance thresholds of 100 lbs/day for each of the criteria air pollutants evaluated.

Long-term operation of the proposed project would not result in a significant impact to regional or local air quality conditions. It is important to note that estimated operational emissions are conservatively based on the default vehicle fleet distribution assumptions contained in the model, which include contributions from medium and heavy-duty trucks. Mobile sources associated with schools typically consist largely to light-duty vehicles and buses. As a result, actual mobile source emissions would likely be less than estimated. This impact is considered ***less than significant***.

Table 7
Long-term Operational Emissions (Unmitigated)

Season	Uncontrolled Annual Emissions (tons/year)[1]					
	ROG	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$
Area Source	0.3	0	0	0	0	0
Energy Use	0	0.1	0.1	0	0	0
Mobile Source[2]	0.4	4.2	3.2	0	0.8	0.3
Total:	0.7	4.3	3.3	0	0.8	0.3
Significance Thresholds (tons):	*10*	*10*	*None*	*None*	*15*	*None*
Exceeds Thresholds/Significant Impact?:	*No*	*No*	*--*	*--*	*No*	*--*
Average Daily On-site Emissions (lbs)[3]:	*3*	*Negligible*				
Significance Thresholds (lbs):	*100*	*100*	*100*	*100*	*100*	*100*
Exceeds Thresholds/Significant Impact?:	*No*	*No*	*No*	*No*	*No*	*No*

1. Emissions were calculated using the CalEEMod computer program. Does not include implementation of emissions control measures.
2. Fleet distribution data for the project is not available. Mobile source emissions are conservatively based on default vehicle fleet distribution for Fresno County, which includes all vehicle types/classifications, including medium and heavy-duty vehicles. Actual emissions would likely be lower. Includes 6.5 percent reduction in mobile-source emissions with implementation of a Safe Routes to School (SRTS) program (SRTSNP 2015).
3. Based on calculated annual operational emissions from area sources and an average of 200 operational days annually.
Totals may not sum due to rounding.
Refer to Appendix A for modeling assumptions and results.

Impact AQ-C. ***Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?***

The SJVAB is currently designated non-attainment for the state and federal ozone and $PM_{2.5}$ ambient air quality standards and the state PM_{10} standard. As discussed in *Impact AQ-B*, short-term construction-generated emissions of ozone-precursor pollutants (e.g., ROG and NO_X) and PM would not exceed SJVAPCD's significance thresholds. However, as noted in Impact AQ-D, fugitive dust generated during construction may result in localized pollutant concentrations that could result in increased nuisance concerns to nearby residents. Uncontrolled increases of construction-generated PM emissions could contribute, on a cumulative basis, to existing non-attainment conditions. As a result, this impact is considered ***potentially significant***.

Mitigation Measure: Implement Mitigation Measure AQ-1 (refer to Impact AQ-D).

Significance after Mitigation: With implementation of Mitigation Measure AQ-1 this impact would be considered less than significant.

Impact AQ-D. ***Would the project expose sensitive receptors to substantial pollutant concentrations?***

Sensitive land uses located in the vicinity of the proposed project site consist predominantly of residential land uses. The nearest residential land use is located approximately 350 feet west of the project site, across Fowler Avenue. Long-term operational and short-term construction activities and emission sources that could adversely impact these nearest sensitive receptors are discussed below:

Long-term Operation

Localized Mobile-Source CO Emissions

Carbon monoxide is the primary criteria air pollutant of local concern associated with the proposed project. Under specific meteorological and operational conditions, such as near areas of heavily congested vehicle traffic, CO concentrations may reach unhealthy levels. If inhaled, CO can be adsorbed easily by the blood stream and can inhibit oxygen delivery to the body, which can cause significant health effects ranging from slight headaches to death. The most serious effects are felt by individuals susceptible to oxygen deficiencies, including people with anemia and those suffering from chronic lung or heart disease.

Mobile-source emissions of CO are a direct function of traffic volume, speed, and delay. Transport of CO is extremely limited because it disperses rapidly with distance from the source under normal meteorological conditions. For this reason, modeling of mobile-source CO concentrations is typically recommended for sensitive land uses located near signalized roadway intersections that are projected to operate at unacceptable levels of service (i.e., LOS E or F). Localized CO concentrations associated with the proposed project would be considered less-than-significant impact if: (1) traffic generated by the proposed project would not result in deterioration of a signalized intersection to a level of service (LOS) of E or F; or (2) the project would not contribute additional traffic to a signalized intersection that already operates at LOS of E or F.

Signalized intersections in the project area include the Clinton Avenue/Fowler Avenue and the Olive Avenue/Fowler Avenue intersections. With implementation of the proposed traffic improvements, these intersections are projected to operate at LOS D, or better, for existing-plus-project, near-term, and future cumulative conditions (JBL 2018). In comparison to the CO screening criteria, implementation of the proposed project would not result in or contribute to unacceptable levels of service (i.e., LOS E, or worse) at nearby signalized intersections. As a result, the proposed project would not be anticipated to contribute substantially to localized CO concentrations that would exceed applicable standards. For this reason, this impact would be considered ***less than significant***.

Toxic Air Contaminants

No major stationary sources of TACs or major agricultural operations are located within one-quarter mile of the project site (SJVAPCD 2018). In addition, the project site is not located within 500 feet of a freeway or other busy traffic corridor. Predicted on-site health risks for on-site student and staff are anticipated to be minor and would not be anticipated to exceed the SJVAPCD's significance thresholds. In addition, implementation of the proposed project would not result in the long-term operation of any major on-site stationary sources of TACs, nor would project implementation result in a significant increase in diesel-fueled vehicles traveling along area roadways. For these reasons, long-term exposure to TACs would be considered ***less than significant***.

Short-term Construction

Naturally Occurring Asbestos

Naturally-occurring asbestos, which was identified by ARB as a TAC in 1986, is located in many parts of California and is commonly associated with ultramafic rock. The project site is not located near any areas that are likely to contain ultramafic rock (DOC 2000). As a result, risk of exposure to asbestos during the construction process would be considered ***less than significant***.

Diesel-Exhaust Emissions

Implementation of the proposed project would result in the generation of DPM emissions during construction associated with the use of off-road diesel equipment for site grading and excavation, paving and other construction activities. Health-related risks associated with diesel-exhaust emissions are primarily associated with long-term exposure and associated risk of contracting cancer. For residential land uses, the calculation of cancer risk associated with exposure of to TACs are typically calculated based on a 25 to 30-year period of exposure. The use of diesel-powered construction equipment, however, would be temporary and episodic and would occur over a relatively large area. Assuming that construction activities involving the use of diesel-fueled equipment would occur over an approximate 18-month period, project-related construction activities would constitute less than six percent of the typical exposure period. As a result, exposure to construction-generated DPM would not be anticipated to exceed applicable thresholds (i.e., incremental increase in cancer risk of 20 in one million). In addition, implementation of Mitigation Measure AQ-1 would result in further reductions of on-site DPM emissions. For these reasons, this impact would be considered ***less than significant***.

Localized PM Concentrations

Construction of the proposed project may result in the generation of fugitive dust. Fugitive dust emissions would be primarily associated with earth-moving, material handling and demolition activities, as well as, vehicle travel on unpaved and paved surfaces. On-site off-road equipment and trucks would also result in short-term emissions of diesel-exhaust PM. Fugitive dust can also be generated during the clearing of vegetation, including the burning of vegetative material. Uncontrolled emissions of fugitive dust may contribute to increased occurrences of Valley Fever and may also result in increased nuisance impacts to nearby land uses and receptors. As a result, localized uncontrolled concentrations of construction-generated PM would be considered to have a ***potentially-significant*** impact.

Mitigation Measure AQ-1: The following measures shall be implemented to reduce potential expose of nearby sensitive receptors to localized concentrations of construction-generated PM:

a. On-road diesel vehicles shall comply with Section 2485 of Title 13 of the California Code of Regulations. This regulation limits idling from diesel-fueled commercial motor vehicles with gross vehicular weight ratings of more than 10,000 pounds and licensed for operation on highways. It applies to California and non-California based vehicles. In general, the regulation specifies that drivers of said vehicles:

    1) Shall not idle the vehicle's primary diesel engine for greater than 5 minutes at any location, except as noted in Subsection (d) of the regulation; and,

    2) Shall not operate a diesel-fueled auxiliary power system to power a heater, air conditioner, or any ancillary equipment on that vehicle during sleeping or resting in a sleeper berth for greater than 5.0 minutes at any location when within 1,000 feet of a restricted area, except as noted in Subsection (d) of the regulation.

b. Off-road diesel equipment shall comply with the 5 minute idling restriction identified in Section 2449(d)(2) of the California Air Resources Board's In-Use off-Road Diesel regulation. The specific requirements and exceptions in the regulations can be reviewed at the following web sites: www.arb.ca.gov/msprog/truck-idling/2485.pdf and ww.arb.ca.gov/regact/2007/ordiesl07/frooal.pdf.

c. Signs shall be posted at the project site construction entrance to remind drivers and operators of the state's 5 minute idling limit.

d. To the extent available, replace fossil-fueled equipment with alternatively-fueled (e.g., natural gas) or electrically-driven equivalents.

e. Construction truck trips shall be scheduled, to the extent feasible, to occur during non-peak hours.

f. The burning of vegetative material shall be prohibited.

g. The proposed project shall comply with SJVAPCD Regulation VIII for the control of fugitive dust emissions. Regulation VIII can be obtained on the SJVAPCD's website at website URL: https://www.valleyair.org/rules/1ruleslist.htm. At a minimum, the following measures shall be implemented:

    1) All disturbed areas, including storage piles, which are not being actively utilized for construction purposes, shall be effectively stabilized of dust emissions using water, chemical stabilizer/suppressant, covered with a tarp or other suitable cover or vegetative ground cover.

2) All on-site unpaved roads and off-site unpaved access roads shall be effectively stabilized of dust emissions using water or chemical stabilizer/suppressant.

3) All land clearing, grubbing, scraping, excavation, land leveling, grading, cut & fill, and demolition activities shall be effectively controlled of fugitive dust emissions utilizing application of water or by presoaking.

4) With the demolition of buildings up to six stories in height, all exterior surfaces of the building shall be wetted during demolition.

5) When materials are transported off-site, all material shall be covered, or effectively wetted to limit visible dust emissions, and at least six inches of freeboard space from the top of the container shall be maintained.

6) All operations shall limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at the end of each workday. (The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions.) (Use of blower devices is expressly forbidden.)

7) Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, said piles shall be effectively stabilized of fugitive dust emissions utilizing sufficient water or chemical stabilizer/suppressant.

8) On-road vehicle speeds on unpaved surfaces of the project site shall be limited to 15 mph.

9) Sandbags or other erosion control measures shall be installed sufficient to prevent silt runoff to public roadways from sites with a slope greater than one percent.

10) Excavation and grading activities shall be suspended when winds exceed 20 mph (Regardless of wind speed, an owner/operator must comply with Regulation VIII's 20 percent opacity limitation).

h. The above measures for the control of construction-generated emissions shall be included on site grading and construction plans.

Impact AQ-E. Would the project create objectionable odors affecting a substantial number of people?

The occurrence and severity of odor impacts depends on numerous factors, including: the nature, frequency, and intensity of the source; wind speed and direction; and the sensitivity of the receptors. While offensive odors rarely cause any physical harm, they still can be very unpleasant, leading to considerable distress among the public and often generating citizen complaints to local governments and regulatory agencies.

No major sources of odors have been identified in the project area. However, construction of the proposed project would involve the use of a variety of gasoline or diesel-powered equipment that would emit exhaust fumes. Exhaust fumes, particularly diesel-exhaust, may be considered objectionable by some people. In addition, pavement coatings and architectural coatings used during project construction would also emit temporary odors. However, construction-generated emissions would occur intermittently throughout the workday and would dissipate rapidly within increasing distance from the source. As a result, short-term construction activities would not expose a substantial number of people to frequent odorous emissions. This impact would be considered ***less than significant***.

GREENHOUSE GASES AND CLIMATE CHANGE

EXISTING SETTING

To fully understand global climate change, it is important to recognize the naturally occurring "greenhouse effect" and to define the greenhouse gases (GHGs) that contribute to this phenomenon. Various gases in the earth's atmosphere, classified as atmospheric GHGs, play a critical role in determining the earth's surface temperature. Solar radiation enters the earth's atmosphere from space and a portion of the radiation is absorbed by the earth's surface. The earth emits this radiation back toward space, but the properties of the radiation change from high-frequency solar radiation to lower-frequency infrared radiation. Greenhouse gases, which are transparent to solar radiation, are effective in absorbing infrared radiation. As a result, this radiation that otherwise would have escaped back into space is now retained, resulting in a warming of the atmosphere. This phenomenon is known as the greenhouse effect. Among the prominent GHGs contributing to the greenhouse effect are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Primary GHGs attributed to global climate change, are discussed, as follows:

- **Carbon Dioxide**. Carbon dioxide (CO_2) is a colorless, odorless gas. CO_2 is emitted in a number of ways, both naturally and through human activities. The largest source of CO_2 emissions globally is the combustion of fossil fuels such as coal, oil, and gas in power plants, automobiles, industrial facilities, and other sources. A number of specialized industrial production processes and product uses such as mineral production, metal production, and the use of petroleum-based products can also lead to CO_2 emissions. The atmospheric lifetime of CO_2 is variable because it is so readily exchanged in the atmosphere (U.S. EPA 2018).

- **Methane**. Methane (CH_4) is a colorless, odorless gas that is not flammable under most circumstances. CH_4 is the major component of natural gas, about 87 percent by volume. It is also formed and released to the atmosphere by biological processes occurring in anaerobic environments. Methane is emitted from a variety of both human-related and natural sources. Human-related sources include fossil fuel production, animal husbandry (enteric fermentation in livestock and manure management), rice cultivation, biomass burning, and waste management. These activities release significant quantities of methane to the atmosphere. Natural sources of methane include wetlands, gas hydrates, permafrost, termites, oceans, freshwater bodies, non-wetland soils, and other sources such as wildfires. Methane's atmospheric lifetime is about 12 years (U.S. EPA 2018).

- **Nitrous Oxide**. Nitrous oxide (N_2O) is a clear, colorless gas with a slightly sweet odor. N_2O is produced by both natural and human-related sources. Primary human-related sources of N_2O are agricultural soil management, animal manure management, sewage treatment, mobile and stationary combustion of fossil fuels, acid production, and nitric acid production. N_2O is also produced naturally from a wide variety of biological sources in soil and water, particularly microbial action in wet tropical forests. The atmospheric lifetime of N_2O is approximately 114 years (U.S. EPA 2018).

- **Hydrofluorocarbons.** Hydrofluorocarbons (HFCs) are man-made chemicals, many of which have been developed as alternatives to ozone-depleting substances for industrial, commercial, and consumer products. The only significant emissions of HFCs before 1990 were of the chemical HFC-23, which is generated as a byproduct of the production of HCFC-22 (or Freon 22, used in air conditioning applications). The atmospheric lifetime for HFCs varies from just over a year for HFC-152a to 270 years for HFC-23. Most of the commercially used HFCs have atmospheric lifetimes of less than 15 years (e.g., HFC-134a, which is used in automobile air conditioning and refrigeration, has an atmospheric life of 14 years) (U.S. EPA 2018).

- **Perfluorocarbons.** Perfluorocarbons (PFCs) are colorless, highly dense, chemically inert, and nontoxic. There are seven PFC gases: perfluoromethane (CF_4), perfluoroethane (C_2F_6), perfluoropropane (C_3F_8), perfluorobutane (C_4F_{10}), perfluorocyclobutane (C_4F_8), perfluoropentane (C_5F_{12}), and perfluorohexane (C_6F_{14}). Natural geological emissions have been responsible for the PFCs that have accumulated in the atmosphere in the past; however, the largest current source is aluminum production, which releases CF_4 and C_2F_6 as byproducts. The estimated atmospheric lifetimes for PFCs ranges from 2,600 to 50,000 years (U.S. EPA 2018).

- **Nitrogen Trifluoride**. Nitrogen trifluoride (NF_3) is an inorganic, colorless, odorless, toxic, nonflammable gas used as an etchant in microelectronics. Nitrogen trifluoride is predominantly employed in the cleaning of the plasma-enhanced chemical vapor deposition chambers in the production of liquid crystal displays and silicon-based thin film solar cells. It has a global warming potential of 16,100 carbon dioxide equivalents (CO_2e). While NF_3 may have a lower global warming potential than other chemical etchants, it is still a potent GHG. In 2009, NF_3 was listed by California as a high global warming potential GHG to be listed and regulated under Assembly Bill (AB) 32 (Section 38505 Health and Safety Code).

- **Sulfur Hexafluoride**. Sulfur hexafluoride (SF_6) is an inorganic compound that is colorless, odorless, nontoxic, and generally nonflammable. SF_6 is primarily used as an electrical insulator in high voltage equipment. The electric power industry uses roughly 80 percent of all SF_6 produced worldwide. Leaks of SF_6 occur from aging equipment and during equipment maintenance and servicing. SF_6 has an atmospheric life of 3,200 years (U.S. EPA 2018).

- **Black Carbon**. Black carbon is the strongest light-absorbing component of particulate matter (PM) emitted from burning fuels such as coal, diesel, and biomass. Black carbon contributes to climate change both directly by absorbing sunlight and indirectly by depositing on snow and by interacting with clouds and affecting cloud formation. Black carbon is considered a short-lived species, which can vary spatially and, consequently, it is very difficult to quantify associated global-warming potentials. The main sources of black carbon in California are wildfires, off-road vehicles (locomotives, marine vessels, tractors, excavators, dozers, etc.), on-road vehicles (cars, trucks, and buses), fireplaces, agricultural waste burning, and prescribed burning (planned burns of forest or wildlands) (CCAC 2018, U.S. EPA 2018).

Each GHG differs in its ability to absorb heat in the atmosphere based on the lifetime, or persistence, of the gas molecule in the atmosphere. Often, estimates of GHG emissions are presented in CO_2e, which weight each gas by its global warming potential (GWP). Expressing GHG emissions in CO_2e takes the contribution of all GHG emissions to the greenhouse effect and converts them to a single unit equivalent to the effect that would occur if only CO_2 were being emitted. Table 8 provides a summary of the GWP for GHG emissions of typical concern with regard to community development projects, based on a 100-year time horizon. As indicated, Methane traps over 25 times more heat per molecule than CO_2, and N_2O absorbs roughly 298 times more heat per molecule than CO_2. Additional GHG with high GWP include Nitrogen trifluoride, Sulfur hexafluoride, Perfluorocarbons, and black carbon.

Table 8
Global Warming Potential for Greenhouse Gases

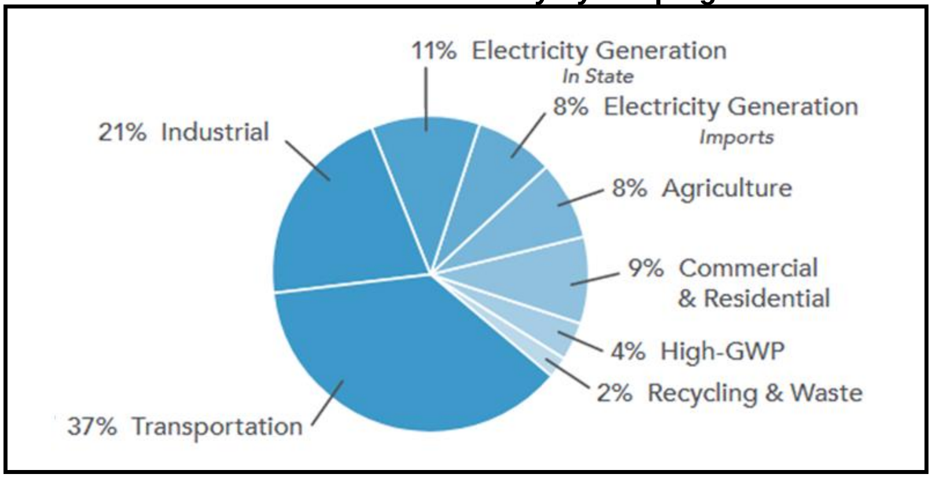
Greenhouse Gas	Global Warming Potential (100-year)
Carbon Dioxide (CO_2)	1
Methane (CH_4)	25
Nitrous Dioxide (N_2O)	298
**Based on IPCC GWP values for 100-year time horizon Source: IPCC 2007*	

SOURCES OF GHG EMISSIONS

On a global scale, GHG emissions are predominantly associated with activities related to energy production; changes in land use, such as deforestation and land clearing; industrial sources; agricultural activities; transportation; waste and wastewater generation; and commercial and residential land uses. World-wide, energy production including the burning of coal, natural gas, and oil for electricity and heat is the largest single source of global GHG emissions (U.S. EPA 2018b).

In 2015, GHG emissions within California totaled 440.4 million metric tons (MMT) of CO_2e. GHG emissions, by sector, are summarized in Figure 2. Within California, the transportation sector is the largest contributor, accounting for approximately 37 percent of the total state-wide GHG emissions. Emissions associated with industrial uses are the second largest contributor, totaling roughly 21 percent. Electricity generation totaled roughly 19 percent (ARB 2018c).

Figure 2
California GHG Emissions Inventory by Scoping Plan Sector



Source: ARB 2017

Short-Lived Climate Pollutants

Short-lived climate pollutants (SLCPs), such as black carbon, fluorinated gases, and methane also have a dramatic effect on climate change. Though short lived, these pollutants create a warming influence on the climate that is many times more potent than that of carbon dioxide.

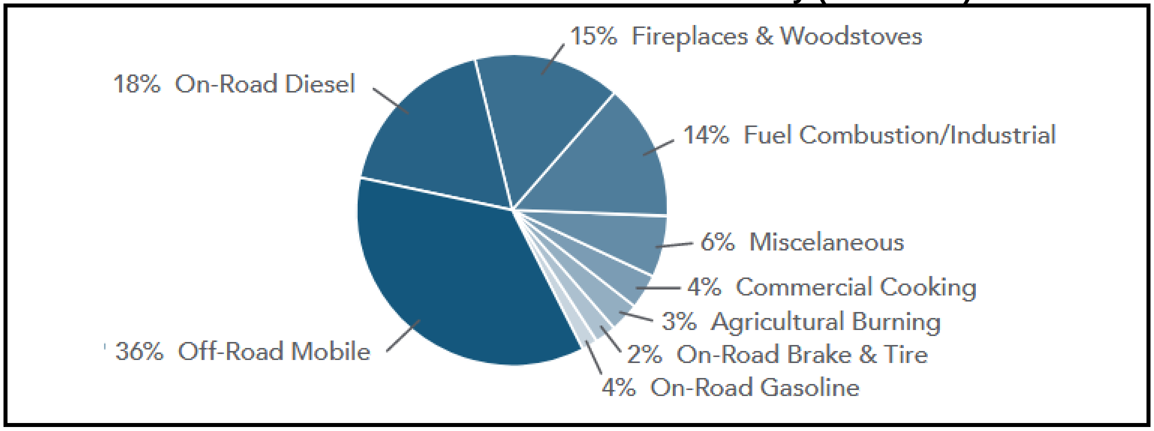
As part of the ARB's efforts to address SLCPs, the ARB has developed a statewide emission inventory for black carbon. The black carbon inventory will help support implementation of the SLCP Strategy, but it is not part of the State's GHG Inventory that tracks progress towards the State's climate targets. The most recent inventory for year 2013 conditions is depicted in Figure 3. As depicted, off-road mobile sources account for a majority of black carbon emissions totaling roughly 36 percent of the inventory. Other major anthropogenic sources of black carbon include on-road transportation, residential wood burning, fuel combustion, and industrial processes (ARB 2017).

EFFECTS OF GLOBAL CLIMATE CHANGE

There are uncertainties as to exactly what the climate changes will be in various local areas of the earth. There are also uncertainties associated with the magnitude and timing of other consequences of a warmer planet: sea level rise, spread of certain diseases out of their usual geographic range, the effect on agricultural production, water supply, sustainability of ecosystems, increased strength and frequency of storms, extreme heat events, increased air pollution episodes, and the consequence of these effects on the economy.

Within California, climate changes would likely alter the ecological characteristics of many ecosystems throughout the state. Such alterations would likely include increases in surface temperatures and changes in the form, timing, and intensity of precipitation. For instance, historical records are depicting an increasing trend toward earlier snowmelt in the Sierra Nevada. This snow pack is a principal supply of water for the state, providing roughly 50 percent of state's annual runoff. If this trend continues, some areas of the state may experience an increased danger of floods during the winter months and possible exhaustion of the

Figure 3
California Black Carbon Emissions Inventory (Year 2013)



Source: ARB 2017

snowpack during spring and summer months. An earlier snowmelt would also impact the State's energy resources. Currently, approximately 20 percent of California's electricity comes from hydropower. An early exhaustion of the Sierra snowpack, may force electricity producers to switch to more costly or non-renewable forms of electricity generation during spring and summer months. A changing climate may also impact agricultural crop yields, coastal structures, and biodiversity. As a result, resultant changes in climate will likely have detrimental effects on some of California's largest industries, including agriculture, wine, tourism, skiing, recreational and commercial fishing, and forestry (PCL 2018).

REGULATORY FRAMEWORK

FEDERAL

Executive Order 13514

Executive Order 13514 is focused on reducing GHGs internally in federal agency missions, programs, and operations. In addition, the executive order directs federal agencies to participate in the Interagency Climate Change Adaptation Task Force, which is engaged in developing a national strategy for adaptation to climate change.

On April 2, 2007, in Massachusetts v. U.S. EPA, 549 U.S. 497 (2007), the Supreme Court found that GHGs are air pollutants covered by the FCAA and that the U.S. EPA has the authority to regulate GHG. The Court held that the U.S. EPA Administrator must determine whether or not emissions of GHGs from new motor vehicles cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare, or whether the science is too uncertain to make a reasoned decision.

On December 7, 2009, the U.S. EPA Administrator signed two distinct findings regarding GHGs under section 202(a) of the Clean Air Act:

- Endangerment Finding: The Administrator found that the current and projected concentrations of the six key well-mixed GHGs (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) in the atmosphere threaten the public health and welfare of current and future generations.
- Cause or Contribute Finding: The Administrator found that the combined emissions of these well-mixed GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution which threatens public health and welfare.

Although these findings did not themselves impose any requirements on industry or other entities, this action was a prerequisite to finalizing the U.S. EPA's Proposed Greenhouse Gas Emission Standards for Light-Duty Vehicles, which was published on September 15, 2009. On May 7, 2010 the final Light-Duty Vehicle Greenhouse Gas Emissions Standards and Corporate Average Fuel Economy Standards was published in the Federal Register.

U.S. EPA and the National Highway Traffic Safety Administration (NHTSA) are taking coordinated steps to enable the production of a new generation of clean vehicles with reduced GHG emissions and improved fuel efficiency from on-road vehicles and engines. These next steps include developing the first-ever GHG regulations for heavy-duty engines and vehicles, as well as additional light-duty vehicle GHG regulations. These steps were outlined by President Obama in a Presidential Memorandum on May 21, 2010.

The final combined U.S. EPA and NHTSA standards that make up the first phase of this national program apply to passenger cars, light-duty trucks, and medium-duty passenger vehicles, covering model years 2012 through 2016. The standards require these vehicles to meet an estimated combined average emissions level of 250 grams of CO_2 per mile (the equivalent to 35.5 miles per gallon if the automobile industry were to meet this CO_2 level solely through fuel economy improvements). Together, these standards will cut GHG emissions by an estimated 960 MMT and 1.8 billion barrels of oil over the lifetime of the vehicles sold under the program (model years 2012-2016). On August 28, 2012, U.S. EPA and NHTSA issued their joint rule to extend this national program of coordinated GHG and fuel economy standards to model years 2017 through 2025 passenger vehicles.

State

Assembly Bill 1493

AB 1493 (Pavley) of 2002 (Health and Safety Code Sections 42823 and 43018.5) requires the ARB to develop and adopt the nation's first GHG emission standards for automobiles. These standards are also known as Pavley I. The California Legislature declared in AB 1493 that global warming is a matter of increasing concern for public health and the environment. It cites several risks that California faces from climate change, including a reduction in the state's water supply; an increase in air pollution caused by higher temperatures; harm to agriculture; an increase in wildfires; damage to the coastline; and economic losses caused by higher food, water, energy, and insurance prices. The bill also states that technological solutions to reduce GHG emissions would stimulate California's economy and provide jobs. In 2004, the State of California submitted a request for a waiver from federal clean air regulations, as the State is authorized to do under the FCAA, to allow the State to require reduced tailpipe emissions of CO_2. In late 2007, the U.S. EPA denied California's waiver request and declined to promulgate adequate federal regulations limiting GHG emissions. In early 2008, the State brought suit against the U.S. EPA related to this denial.

In January 2009, President Obama instructed the U.S. EPA to reconsider the Bush Administration's denial of California's and 13 other states' requests to implement global warming pollution standards for cars and trucks. In June 2009, the U.S. EPA granted California's waiver request, enabling the State to enforce its GHG emissions standards for new motor vehicles beginning with the current model year.

In 2009, President Obama announced a national policy aimed at both increasing fuel economy and reducing GHG pollution for all new cars and trucks sold in the US. The new standards would cover model years 2012 to 2016 and would raise passenger vehicle fuel economy to a fleet average of 35.5 miles per gallon by 2016. When the national program takes effect, California has committed to allowing automakers who show compliance with the national program to also be deemed in compliance with state requirements. California is committed to further strengthening these standards beginning in 2017 to obtain a 45 percent GHG reduction from the 2020 model year vehicles.

Executive Order No. S-3-05

Executive Order S-3-05 (State of California) proclaims that California is vulnerable to the impacts of climate change. It declares that increased temperatures could reduce the Sierra's snowpack, further exacerbate California's air quality problems, and potentially cause a rise in sea levels. To combat those concerns, the

Executive Order established total GHG emission targets. Specifically, emissions are to be reduced to the 2000 level by 2010, to the 1990 level by 2020, and to 80 percent below the 1990 level by 2050.

The Executive Order directed the secretary of the California Environmental Protection Agency (CalEPA) to coordinate a multi-agency effort to reduce GHG emissions to the target levels. The secretary will also submit biannual reports to the governor and state legislature describing (1) progress made toward reaching the emission targets, (2) impacts of global warming on California's resources, and (3) mitigation and adaptation plans to combat these impacts. To comply with the Executive Order, the secretary of CalEPA created a Climate Action Team made up of members from various state agencies and commissions. The Climate Action Team released its first report in March 2006 and continues to release periodic reports on progress. The report proposed to achieve the targets by building on voluntary actions of California businesses, local government and community actions, as well as through state incentive and regulatory programs.

Assembly Bill 32 - California Global Warming Solutions Act of 2006

AB 32 (Health and Safety Code Sections 38500, 38501, 28510, 38530, 38550, 38560, 38561–38565, 38570, 38571, 38574, 38580, 38590, 38592–38599) requires that statewide GHG emissions be reduced to 1990 levels by the year 2020. The gases that are regulated by AB 32 include CO_2, CH_4, N_2O, HFCs, PFCs, NF_3, and SF_6. The reduction to 1990 levels will be accomplished through an enforceable statewide cap on GHG emissions that will be phased in starting in 2012. To effectively implement the cap, AB 32 directs ARB to develop and implement regulations to reduce statewide GHG emissions from stationary sources. AB 32 specifies that regulations adopted in response to AB 1493 should be used to address GHG emissions from vehicles. However, AB 32 also includes language stating that if the AB 1493 regulations cannot be implemented, then ARB should develop new regulations to control vehicle GHG emissions under the authorization of AB 32.

AB 32 requires that ARB adopt a quantified cap on GHG emissions representing 1990 emissions levels and disclose how it arrives at the cap, institute a schedule to meet the emissions cap, and develop tracking, reporting, and enforcement mechanisms to ensure that the state achieves reductions in GHG emissions necessary to meet the cap. AB 32 also includes guidance to institute emissions reductions in an economically efficient manner and conditions to ensure that businesses and consumers are not unfairly affected by the reductions.

Climate Change Scoping Plan

In October 2008, ARB published its *Climate Change Proposed Scoping Plan*, which is the State's plan to achieve GHG reductions in California required by AB 32. This initial Scoping Plan contained the main strategies to be implemented in order to achieve the target emission levels identified in AB 32. The Scoping Plan included ARB-recommended GHG reductions for each emissions sector of the state's GHG inventory. The largest proposed GHG reduction recommendations were associated with improving emissions standards for light-duty vehicles, implementing the Low Carbon Fuel Standard program, implementation of energy efficiency measures in buildings and appliances, and the widespread development of combined heat and power systems, and developing a renewable portfolio standard for electricity production.

The Scoping Plan states that land use planning and urban growth decisions will play important roles in the state's GHG reductions because local governments have primary authority to plan, zone, approve, and permit how land is developed to accommodate population growth and the changing needs of their jurisdictions. ARB further acknowledges that decisions on how land is used will have large impacts on the GHG emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas emissions sectors. With regard to land use planning, the Scoping Plan expects approximately 5.0 MMT CO_2e will be achieved associated with implementation of Senate Bill 375, which is discussed further below.

The initial Scoping Plan was first approved by ARB on December 11, 2008 and is updated every five years. The first update of the Scoping Plan was approved by the ARB on May 22, 2014, which looked past 2020 to set mid-term goals (2030-2035) on the road to reaching the 2050 goals., The most recent update released by ARB is the *2017 Climate Change Scoping Plan*, which was released In November 2017. The *2017 Climate Change Scoping Plan* incorporates strategies for achieving the 2030 GHG-reduction target established in SB 32 and EO B-30-15.

Senate Bill 1078 and Governor's Order S-14-08 (California Renewables Portfolio Standards)

Senate Bill 1078 (Public Utilities Code Sections 387, 390.1, 399.25 and Article 16) addresses electricity supply and requires that retail sellers of electricity, including investor-owned utilities and community choice aggregators, provide a minimum 20 percent of their supply from renewable sources by 2017. This Senate Bill will affect statewide GHG emissions associated with electricity generation. In 2008, Governor Schwarzenegger signed Executive Order S-14-08, which set the Renewables Portfolio Standard target to 33 percent by 2020. It directed state government agencies and retail sellers of electricity to take all appropriate actions to implement this target. Executive Order S-14-08 was later superseded by Executive Order S-21-09 on September 15, 2009. Executive Order S-21-09 directed the ARB to adopt regulations requiring 33 percent of electricity sold in the State come from renewable energy by 2020. Statute SB X1-2 superceded this Executive Order in 2011, which obligated all California electricity providers, including investor-owned utilities and publicly owned utilities, to obtain at least 33 percent of their energy from renewable electrical generation facilities by 2020.

ARB is required by current law, AB 32 of 2006, to regulate sources of GHGs to meet a state goal of reducing GHG emissions to 1990 levels by 2020 and an 80 percent reduction of 1990 levels by 2050. The California Energy Commissions and California Public Utilities Commission serve in advisory roles to help ARB develop the regulations to administer the 33 percent by 2020 requirement. ARB is also authorized to increase the target and accelerate and expand the time frame.

Mandatory Reporting of GHG Emissions

The California Global Warming Solutions Act (AB 32, 2006) requires the reporting of GHGs by major sources to the ARB. Major sources required to report GHG emissions include industrial facilities, suppliers of transportation fuels, natural gas, natural gas liquids, liquefied petroleum gas, and carbon dioxide, operators of petroleum and natural gas systems, and electricity retail providers and marketers.

Cap-and-Trade Regulation

The cap-and-trade regulation is a key element in California's climate plan. It sets a statewide limit on sources responsible for 85 percent of California's GHG emissions and establishes a price signal needed to drive long-term investment in cleaner fuels and more efficient use of energy. The cap-and-trade rules came into effect on January 1, 2013, and apply to large electric power plants and large industrial plants. In 2015, fuel distributors, including distributors of heating and transportation fuels, also became subject to the cap-and-trade rules. At that stage, the program will encompass around 360 businesses throughout California and nearly 85 percent of the state's total GHG emissions.

Under the cap-and-trade regulation, companies must hold enough emission allowances to cover their emissions and are free to buy and sell allowances on the open market. California held its first auction of GHG allowances on November 14, 2012. California's GHG cap-and-trade system is projected to reduce GHG emissions to 1990 levels by the year 2020 and would achieve an approximate 80 percent reduction from 1990 levels by 2050.

Senate Bill 32

SB 32 was signed by Governor Brown on September 8, 2016. SB 32 effectively extends California's GHG emission-reduction goals from year 2020 to year 2030. This new emission-reduction target of 40 percent below 1990 levels by 2030 is intended to promote further GHG-reductions in support of the State's ultimate goal of reducing GHG emissions by 80 percent below 1990 levels by 2050. SB 32 also directs the ARB to update the Climate Change Scoping Plan to address this interim 2030 emission-reduction target.

Senate Bill 375

SB 375 requires Metropolitan Planning Organizations (MPOs) to adopt a sustainable communities strategy (SCS) or alternative planning strategy (APS) that will address land use allocation in that MPOs regional transportation plan. ARB, in consultation with MPOs, establishes regional reduction targets for GHGs emitted by passenger cars and light trucks for the years 2020 and 2035. These reduction targets will be updated every eight years but can be updated every four years if advancements in emissions technologies affect the reduction strategies to achieve the targets. ARB is also charged with reviewing each MPO's SCS or APS for consistency with its assigned targets. If MPOs do not meet the GHG reduction targets, funding for transportation projects may be withheld.

California Building Code

The California Building Code (CBC) contains standards that regulate the method of use, properties, performance, or types of materials used in the construction, alteration, improvement, repair, or rehabilitation of a building or other improvement to real property. The California Building Code is adopted every three years by the Building Standards Commission (BSC). In the interim, the BSC also adopts annual updates to make necessary mid-term corrections. The CBC standards apply statewide; however, a local jurisdiction may amend a CBC standard if it makes a finding that the amendment is reasonably necessary due to local climatic, geological, or topographical conditions.

Green Building Standards

In essence, green buildings standards are indistinguishable from any other building standards. Both standards are contained in the California Building Code and regulate the construction of new buildings and improvements. The only practical distinction between the two is that whereas the focus of traditional building standards has been protecting public health and safety, the focus of green building standards is to improve environmental performance.

AB 32, which mandates the reduction of GHG emissions in California to 1990 levels by 2020, increased the urgency around the adoption of green building standards. In its scoping plan for the implementation of AB 32, ARB identified energy use as the second largest contributor to California's GHG emissions, constituting roughly 25 percent of all such emissions. In recommending a green building strategy as one element of the scoping plan, ARB estimated that green building standards would reduce GHG emissions by approximately 26 MMT of CO_2e by 2020. The green buildings standards were most recently updated in 2016.

Senate Bill 97

Senate Bill 97 (SB 97) was enacted in 2007. SB 97 required OPR to develop, and the Natural Resources Agency to adopt, amendments to the CEQA Guidelines addressing the analysis and mitigation of GHG emissions. Those CEQA Guidelines amendments clarified several points, including the following:

- Lead agencies must analyze the GHG emissions of proposed projects and must reach a conclusion regarding the significance of those emissions.
- When a project's GHG emissions may be significant, lead agencies must consider a range of potential mitigation measures to reduce those emissions.
- Lead agencies must analyze potentially significant impacts associated with placing projects in hazardous locations, including locations potentially affected by climate change.
- Lead agencies may significantly streamline the analysis of GHGs on a project level by using a programmatic GHG emissions reduction plan meeting certain criteria.
- CEQA mandates analysis of a proposed project's potential energy use (including transportation-related energy), sources of energy supply and ways to reduce energy demand, including through the use of efficient transportation alternatives.

As part of the administrative rulemaking process, the California Natural Resources Agency developed a Final Statement of Reasons explaining the legal and factual bases, intent, and purpose of the CEQA Guidelines amendments. The amendments to the CEQA Guidelines implementing SB 97 became effective on March 18, 2010.

Short-Lived Climate Pollutant Reduction Strategy

In March 2017, the ARB adopted the *Short-Lived Climate Pollutant Reduction Strategy* (*SLCP Strategy*) establishing a path to decrease GHG emissions and displace fossil-based natural gas use. Strategies include avoiding landfill methane emissions by reducing the disposal of organics through edible food recovery, composting, in-vessel digestion, and other processes; and recovering methane from wastewater treatment facilities, and manure methane at dairies, and using the methane as a renewable source of natural gas to fuel vehicles or generate electricity. The *SLCP Strategy* also identifies steps to reduce natural gas leaks from oil and gas wells, pipelines, valves, and pumps to improve safety, avoid energy losses, and reduce methane emissions associated with natural gas use. Lastly, the *SLCP Strategy* also identifies measures that can reduce hydrofluorocarbon (HFC) emissions at national and international levels, in addition to State-level action that includes an incentive program to encourage the use of low-Global Warming Potential (GWP) refrigerants, and limitations on the use of high-GWP refrigerants in new refrigeration and air-conditioning equipment (ARB 2017).

San Joaquin Valley Air Pollution Control District

<u>*SJVAPCD Climate Change Action Plan*</u>

On August 21, 2008, the SJVAPCD Governing Board approved the SJVAPCD's *Climate Change Action Plan* with the following goals and actions:

Goals:

- Assist local land-use agencies with California Environmental Quality Act (CEQA) issues relative to projects with GHG emissions increases.
- Assist Valley businesses in complying with mandates of AB 32.
- Ensure that climate protection measures do not cause increase in toxic or criteria pollutants that adversely impact public health or environmental justice communities.

Actions:

- Authorize the Air Pollution Control Officer to develop GHG significance threshold(s) or other mechanisms to address CEQA projects with GHG emissions increases. Begin the requisite public process, including public workshops, and develop recommendations for Governing Board consideration in the spring of 2009.
- Authorize the Air Pollution Control Officer to develop necessary regulations and instruments for establishment and administration of the San Joaquin Valley Carbon Exchange Bank for voluntary GHG reductions created in the Valley. Begin the requisite public process, including public workshops, and develop recommendations for Governing Board consideration in spring 2009.
- Authorize the Air Pollution Control Officer to enhance the SJVAPCD's existing criteria pollutant emissions inventory reporting system to allow businesses subject to AB32 emission reporting requirements to submit simultaneous streamlined reports to the SJVAPCD and the state of California with minimal duplication.
- Authorize the Air Pollution Control Officer to develop and administer voluntary GHG emission reduction agreements to mitigate proposed GHG increases from new projects.
- Direct the Air Pollution Control Officer to support climate protection measures that reduce GHG emissions as well as toxic and criteria pollutants. Oppose measures that result in a significant increase in toxic or criteria pollutant emissions in already impacted area.

<u>*SJVAPCD CEQA Greenhouse Gas Guidance.*</u>

On December 17, 2009, the SJVAPCD Governing Board adopted "Guidance for Valley Land-use Agencies in Addressing GHG Emission Impacts for New Projects under CEQA" and the policy, "District Policy—Addressing GHG Emission Impacts for Stationary Source Projects Under CEQA When Serving as the Lead Agency." The SJVAPCD concluded that the existing science is inadequate to support quantification of the impacts that project specific greenhouse gas emissions have on global climatic change. The SJVAPCD found the effects of project-specific emissions to be cumulative, and without mitigation, that their incremental contribution to global climatic change could be considered cumulatively considerable. The SJVAPCD found that this cumulative impact is best addressed by requiring all projects to reduce their greenhouse gas emissions, whether through project design elements or mitigation.

The SJVAPCD's approach is intended to streamline the process of determining if project-specific greenhouse gas emissions would have a significant effect. Projects exempt from the requirements of CEQA, and projects complying with an approved plan or mitigation program would be determined to have a less than significant cumulative impact. Such plans or programs must be specified in law or adopted by the public agency with jurisdiction over the affected resources and have a certified final CEQA document.

Best performance standards (BPS) would be established according to performance-based determinations. Projects complying with BPS would not require specific quantification of greenhouse gas emissions and would be determined to have a less than significant cumulative impact for greenhouse gas emissions. Projects not complying with BPS would require quantification of greenhouse gas emissions and demonstration that greenhouse gas emissions have been reduced or mitigated by 29 percent, as targeted by ARB's AB 32 Scoping Plan. Furthermore, quantification of greenhouse gas emissions would be required for all projects for which the lead agency has determined that an Environmental Impact Report is required, regardless of whether the project incorporates Best Performance Standards.

For stationary source permitting projects, best performance standards are "the most stringent of the identified alternatives for control of greenhouse gas emissions, including type of equipment, design of equipment and operational and maintenance practices, which are achieved-in-practice for the identified service, operation, or emissions unit class." For development projects, best performance standards are "any combination of identified greenhouse gas emission reduction measures, including project design elements and land use decisions that reduce project specific greenhouse gas emission reductions by at least 29 percent compared with business as usual." The SJVAPCD proposes to create a list of all approved Best Performance Standards to help in the determination as to whether a proposed project has reduced its GHG emissions by 29 percent.

IMPACTS & MITIGATION MEASURES

METHODOLOGY

Short-term Impacts

Short-term construction emissions associated with the proposed project were calculated using the CalEEMod computer program. Modeling includes emissions generated during site preparation/grading, asphalt paving, facility construction, and application of architectural coatings. Detailed construction information, including construction schedules and equipment requirements, has not been identified for the proposed project. Default construction phases and equipment assumptions contained in the CalEEMod model were, therefore, relied upon for the calculation of construction-generated emissions. To be conservative, construction was assumed to begin in 2018 and occur over an approximate As previously noted, an estimated date of project construction has not yet been identified. However, the District estimates that the school could be constructed within approximately five years. To be conservative, construction of the project was assumed to begin in 2018. Due to anticipated reductions in future fleet-average emission rates, emissions for post-year 2018 conditions would be less. Modeling assumptions and output files are included in Appendix A of this report.

Long-term Impacts

Long-term operational GHG emissions associated with the proposed project were calculated using the CalEEMod computer program. Modeling was conducted based on traffic data derived, in part, from the traffic analysis prepared for the proposed project (JLB 2018). Mobile-source emissions were conservatively based on the default fleet distribution assumptions contained in the model. All other modeling assumptions were based on the default parameters contained in the CalEEMod computer model. As previously noted, an estimated date of project construction and opening have not yet been identified. However, the District estimates that the school could be constructed within approximately five years. To be conservative, initial operation of the project was assumed to begin in 2020. Due to anticipated reductions in future fleet-average mobile-source and energy emission rates, emissions for post-year 2020 operational conditions would be less. Modeling assumptions and output files are included in Appendix A of this report.

THRESHOLDS OF SIGNIFICANCE

In accordance with Appendix G of the CEQA Guidelines Initial Study Checklist, a project would be considered to have a significant impact to climate change if it would:

a) Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment; or,

b) Conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of GHGs.

San Joaquin Valley Air Pollution Control District

In accordance with the SJVAPCD's *Guidance for Valley Land-use Agencies in Addressing GHG Emission Impacts for New Projects Under CEQA* (SJVAPCD 2009), a project would be considered to have a less than significant impact on climate change if it would comply with at least one of the following criteria:

- Comply with an approved GHG emission reduction plan or GHG mitigation program which avoids or substantially reduces GHG emissions within the geographic area in which the project is located. Such plans or programs must be specified in law or approved by the lead agency with jurisdiction over the affected resource and supported by a CEQA compliant environmental review document adopted by the lead agency, or
- Implement approved best performance standards, or
- Quantify project GHG emissions and reduce those emissions by at least 29 percent compared to "business as usual" (BAU).

The SJVAPCD has not yet adopted best performance standards for development projects. In addition, although the City of Fresno has adopted a GHG-reduction plan for emissions generated by activities under the control or influence of the City, the City's GHG-reduction plan does not specifically address the development of schools for which the FUSD is the lead agency. The quantification of project-generated GHG emissions in comparison to BAU conditions to determine consistency with AB 32's reduction goals is considered appropriate in some instances. However, based on the California Supreme Court's decision in *Center for Biological Diversity v. California Department of Fish and Wildlife and Newhall Land and Farming (2015) 224 Cal.App.4th 1105 (CBD vs. CDFW;* also known as the *"Newhall Ranch case")*, substantial evidence would need to be provided to document that project-level reductions in comparison to a BAU approach would be consistent with achieving AB 32's overall statewide reduction goal. Given that AB 32's statewide goal includes reductions that are not necessarily related to an individual development project, the use of this approach may be difficult to support given the lack of substantial evidence to adequately demonstrate a link between the data contained in the AB 32 Scoping Plan and individual development projects. Alternatively, the Court identified potential options for evaluating GHG impacts for individual development projects, which included the use of GHG efficiency metrics. In general, GHG efficiency metrics can be used to assess the GHG efficiency of an individual project based on a per capita basis or on a service population basis.

A GHG efficiency threshold based on service population can be calculated by dividing the GHG emissions inventory goal (allowable emissions), by the estimated service population of the individual project. For most development projects, service population is traditionally defined as the sum of the number of jobs and the number of residents provided by a project. However, this traditional definition of service population may not be applicable to all projects, depending on the end use. For instance, with regard to schools, the student and employee population is the primary generator of GHG emissions with a majority of the school's emissions being associated with student vehicle trips. Therefore, the calculated GHG efficiency of the proposed project was expanded to include the proposed student and employee population. GHG efficiency for the proposed project was calculated for years 2020 and 2030 to be consistent with state GHG-reduction target years. The methodology used for quantification of the target efficiency threshold applied to the proposed project is summarized in Table 9. Project-generated GHG emissions that would exceed the efficiency threshold of 4.9 $MTCO_2e$ per service population ($MTCO_2e$/SP/year) in year 2020 or 2.6

$MTCO_2e$/SP/year in 2030 would be considered to have a potentially significant impact on the environment that could conflict with GHG-reduction planning efforts. To be conservative, construction-generated GHG emissions were amortized based on an estimated 30-year project life and included in annual operational GHG emissions estimates.

Table 9
Project-Level GHG Efficiency Threshold Calculation

	2020	2030
Land Use Sectors GHG Emissions Target[1]	287,000,000	168,000,000
Population[2]	40,619,346	44,085,600
Employment[3]	18,195,720	20,908,816
Service Population	58,815,066	64,994,416
GHG Efficiency Threshold ($MTCO_2e$/SP/yr)	4.9	2.6

Based on AB 32 Scoping Plan's land use inventory sectors for years 2020 and 2030; Includes transportation sources.
1. *California Air Resources Board. California 1990 Greenhouse Gas Emissions Level and 2020 Limit — by Sector and Activity (Land Use-driven sectors only) MMT CO2e - (based upon IPCC Fourth Assessment Report Global Warming Potentials)*
2. *California Department of Finance Demographic Research Unit Report P-2 "State and County Population Projections by Race/Ethnicity and Age (5-year groups)" 2010 through 2060 (as of July 1). Published 12/15/2014*
3. *California Department of Finance Employment Development Department. Industry Employment Projections Labor Market Information Division 2010-2020 (Published 5/23/2012) and 2012-2022 (Published 9/19/2014)*

PROJECT IMPACTS

Impact GHG-A. Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment? and

Implementation of the proposed project would contribute to increases of GHG emissions that are associated with global climate change. Short-term and long-term GHG emissions associated with the development of the proposed project are discussed in greater detail, as follows:

Short-term Greenhouse Gas Emissions

Short-term annual GHG emissions are summarized in Table 10. Based on the modeling conducted, annual emissions of GHGs associated with construction of the proposed project would total approximately 644 $MTCO_2e$. There would also be a small amount of GHG emissions from waste generated during construction; however, this amount is speculative. Actual emissions would vary, depending on various factors including construction schedules, equipment required, and activities conducted. Assuming an average project life of 30 years, amortized construction-generated GHG emissions would total approximately 21.5 $MTCO_2e$/yr. Amortized construction-generated GHG emissions were included in the operational GHG emissions inventory for the evaluation of project-generated GHG emissions (refer to Table 11).

Table 10
Short-Term Construction GHG Emissions

Construction Year	Total GHG Emissions ($MTCO_2e$)
Year 1	235
Year 2	409
Total:	644
Amortized Construction Emissions:	21.5

Based on CalEEMod computer modeling. Assumes a 30-year project life. Refer to Appendix A for modeling results and assumptions.

Long-term Greenhouse Gas Emissions

Estimated long-term increases in GHG emissions associated with the proposed project are summarized in Table 11. Based on the modeling conducted, operational GHG emissions would total approximately 1,678.2 $MTCO_2e$/year in 2020 and approximately 1,395.1 $MTCO_2e$/year in 2030. With the inclusion of amortized construction emissions, operational GHG emissions would total approximately 1,699.7 $MTCO_2e$/year in 2020 and approximately 1,416.6 $MTCO_2e$/year in 2030. Based on this estimate and assuming a population of 750 students and 50 employees, the calculated GHG efficiency for the proposed project would be 2.1 $MTCO_2e$/SP/yr in 2020 and 1.8 $MTCO_2e$/SP/yr in 2020. The GHG efficiency for the proposed project would not exceed the thresholds of 4.9 $MTCO_2e$/SP/yr in 2020 or 2.6 $MTCO_2e$/SP/yr in 2030.

Table 11
Long-term Operational GHG Emissions

Emissions Source	GHG Emissions ($MTCO_2e$ per year) [1]	
	Year 2020	Year 2030
Energy Use	170.0	147.2
Mobile Sources[2]	1,483.9	1,224.9
Waste Generation[3]	17.2	17.2
Water Use[4]	7.1	5.8
Total Project Operational Emissions:	1,678.2	1,395.1
Amortized Construction Emissions:	21.5	21.5
Net Increase:	1,699.7	1,416.6
Project GHG Efficiency ($MTCO_2e$/SP/yr)[5]:	2.1	1.8
Project GHG Efficiency with SRTS Program ($MTCO_2e$/SP/yr)[5,6]:	2.0	1.7
GHG Efficiency Threshold ($MTCO_2e$/SP/yr):	4.9	2.6
Exceeds Threshold/Significant Impact?	No	No

1. Project-generated emissions were quantified using the CalEEMod computer program.
2. Fleet distribution data for the project is not available. Mobile source emissions are conservatively based on default vehicle fleet distribution for Fresno County, which includes all vehicle types/classificaations, including medium and heavy-duty vehicles. Actual emissions would likely be lower.
3. Assumes compliance with state-wide waste diversion target of 75 percent by 2020, per AB 341.
4. Includes installation of low-flow water fixtures and water-efficient irrigation systems, per California's 2015 water-efficiency standards.
5. Based on a combined student and employee population of 800 individuals.
6. Includes 6.5 percent reduction in mobile-source emissions with implementation of a Safe Routes to School (SRTS) program (SRTSNP 2015).
Refer to Appendix A for modeling results and assumptions.

As depicted in Table 11, operational GHG emissions associated with the proposed project would be predominantly associated with mobile sources. With the implementation of a Safe Routes to School (SRTS) program, mobile-source emissions would be reduced by approximately 6.5 percent, which would result in additional reductions in overall operational GHG emissions (SRTSNP 2015). With implementation of a SRTS program, the calculated GHG efficiency for the proposed project would be 2.0 $MTCO_2e$/SP/yr in 2020 and 1.7 $MTCO_2e$/SP/yr in 2030.

It is also important to note that mobile-source emissions were conservatively calculated, based on the default fleet distribution assumptions contained in the model, which includes medium and heavy-duty vehicles. Mobile sources associated with schools typically consist largely to light-duty vehicles and buses. As a result, actual mobile-source emissions would be less. Nonetheless, because the GHG efficiency for the proposed project would not exceed the efficiency thresholds of 4.9 $MTCO_2e$/SP/yr in 2020 or 2.6 $MTCO_2e$/SP/yr in 2030, this impact would be considered ***less than significant***.

Impact GHG-B.	***Would the project conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases?***

As noted in Impact GHG-A, the proposed project would not result in increased GHG emissions that would conflict with AB 32 GHG-reduction targets. The proposed project would be designed to meet current building energy-efficiency standards, which includes measures to reduce overall energy use, water use, and waste generation. The project would also be designed to promote the use of alternative means of transportation, such as bicycle use, and to provide improved pedestrian access that would link the project site to nearby land uses. These improvements would help to further reduce the project's GHG emissions and would also help to reduce community-wide GHG emissions. For these reasons, the proposed project would not conflict with local or state GHG-reduction planning efforts. This impact would be considered ***less than significant***.

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APPENDIX A

EMISSIONS MODELING & DOCUMENTATION

PUBLIC RECORD RELEASE REQUEST FOR

Ambient Air Quality and Noise Consulting Kurt Legleiter
PRR Request #: C-2018-8-33

Proposed Location:
The school is located at northeast corner of North Fowler Avenue and McKinley Avenue alignment (LatLong 39.766732, -119.680758) in Fresno.

The San Joaquin Valley Air Pollution District has reviewed the location according to Public Resource Code 21151.8 and makes the following conclusions:

Permitted Facilities:

- No Permitted facilities are located within a ¼ mile. Permitted Facility below is located within a ½ mile.

FACID	FNAME	FSTREET	FCITY	FZIP	LAT	LONG
2207	FRESNO NEON SIGN	5901 E	FRESNO	93727	36.772253	-119.68657

Freeway, High Volume Roadways, & Railways:

- The District recommends the PRR applicant contact CALTRANs and/or their local transportation agency to identify freeways and busy traffic corridors as defined in the Health and Safety Code.
- No Railways are located within a ¼ mile.

Prepared by
Will Worthley
Technical Services

EMISSIONS SUMMARY

Construction Phase	Uncontrolled Maximum Annual Emissions (TPY) [1]						Days	Uncontrolled Maximum Average Daily Emissions (lbs/day) [1]					
	ROG	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$		ROG	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$
Year 2018													
Demolition	0.04	0.39	0.23	0	0.02	0.02	20	8.0	78.0	46.0	0.0	4.0	4.0
Site Preparation	0.02	0.24	0.11	0	0.1	0.06	10	4.0	48.0	22.0	0.0	20.0	12.0
Grading	0.09	1.1	0.6	0	0.2	0.1	35	5.1	62.9	34.3	0.0	11.4	5.7
Building Construction	0.06	0.7	0.5	0	0.1	0.03	83	1.4	16.9	12.0	0.0	2.4	0.7
Total:	0.21	2.43	1.44	0	0.42	0.21							
Year 2019													
Building Construction	0.3	2.8	2.2	0	0.2	0.1	202	3.0	27.7	21.8	0.0	2.0	1.0
Paving	0.02	0.15	0.15	0	0.01	0.01	20	2.0	15.0	15.0	0.0	1.0	1.0
Architectural Coating	0.4	0.1	0.1	0	0	0	70	11.4	2.9	2.9	0.0	0.0	0.0
Total:	0.72	3.05	2.45	0	0.21	0.11		16.4	45.6	39.6	0.0	3.0	2.0
							Maximum Avg.-Daily On-site Emissions:	16.4	78.0	46.0		20.0	12.0

CUSD Fowler-McKinley ES

Fresno County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Elementary School	750.00	Student	22.00	59,500.00	800
Parking Lot	122.00	Space	1.10	48,800.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	45
Climate Zone	3			**Operational Year**	2020
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	488.3	**CH4 Intensity (lb/MWhr)**	0.022	**N2O Intensity (lb/MWhr)**	0.005

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Includes RPS adjustment

Land Use - 750 students. 50 staff. 22 acres. assumes 122 space parking lot per equivalent sized school project.

Construction Phase - Based on model defaults. Building phase based on construction information for a similar sized school. Arch coating assumed to occur over last quarter of building phase (70 days) based on similar school construction project.

Off-road Equipment - Equipment based on model defaults.

Grading - Based on model defaults.

Demolition - Assumes 2,000 sf to be demolished

Trips and VMT - Based on model defaults.

On-road Fugitive Dust - Based on model defaults.

Architectural Coating - Based on model defaults.

Vehicle Trips - 1.89 trips/student per traffic analysis

Vehicle Emission Factors - Based on model defaults.

Vehicle Emission Factors -

Vehicle Emission Factors -

Road Dust - Based on model defaults.

Consumer Products - Based on model defaults.

Area Coating - Based on model defaults.

Landscape Equipment - Based on model defaults.

Energy Use - Based on model defaults. includes RPS adjustment

Water And Wastewater - Based on model defaults.

Solid Waste - Based on model defaults.

Construction Off-road Equipment Mitigation - Includes T3 equipment, 50% CE for watering unpaved travel surfaces, 61%CE for watering exposed surfaces, onsite speed limit of 15 mph

Area Mitigation -

Energy Mitigation - Includes installation of high efficiency lighting

Water Mitigation - Includes installation of low-flow water fixtures and water-efficient irrigation systems

Waste Mitigation - Assumes min 50% diversion rate per statewide average

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	6.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	9.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
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tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3

tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstructionPhase	NumDays	20.00	70.00
tblConstructionPhase	NumDays	370.00	285.00
tblConstructionPhase	PhaseEndDate	5/20/2020	4/7/2020
tblConstructionPhase	PhaseEndDate	3/25/2020	11/27/2019
tblConstructionPhase	PhaseEndDate	4/22/2020	12/25/2019
tblConstructionPhase	PhaseStartDate	4/23/2020	1/1/2020
tblConstructionPhase	PhaseStartDate	3/26/2020	11/28/2019
tblLandUse	LandUseSquareFeet	62,702.53	59,500.00
tblLandUse	LotAcreage	1.44	22.00
tblLandUse	Population	0.00	800.00
tblProjectCharacteristics	CH4IntensityFactor	0.029	0.022
tblProjectCharacteristics	CO2IntensityFactor	641.35	488.3
tblProjectCharacteristics	N2OIntensityFactor	0.006	0.005
tblVehicleTrips	WD_TR	1.29	1.89

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					
2018	0.2244	2.2963	1.4418	2.5700e-003	0.2594	0.1150	0.3744	0.1171	0.1067	0.2239						234.7437
2019	0.3315	2.9557	2.4006	4.4600e-003	0.0580	0.1635	0.2214	0.0157	0.1536	0.1693						398.3204
2020	0.4337	0.0598	0.0729	1.3000e-004	2.5200e-003	3.9000e-003	6.4200e-003	6.7000e-004	3.9000e-003	4.5700e-003						11.1348
Maximum	**0.4337**	**2.9557**	**2.4006**	**4.4600e-003**	**0.2594**	**0.1635**	**0.3744**	**0.1171**	**0.1536**	**0.2239**						**398.3204**

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					
2018	0.0678	1.2136	1.5035	2.5700e-003	0.1111	0.0584	0.1695	0.0484	0.0584	0.1067						234.7434
2019	0.1226	2.1041	2.5110	4.4600e-003	0.0580	0.1156	0.1735	0.0157	0.1154	0.1312						398.3200
2020	0.4273	0.0484	0.0729	1.3000e-004	2.5200e-003	3.3400e-003	5.8600e-003	6.7000e-004	3.3400e-003	4.0100e-003						11.1347
Maximum	**0.4273**	**2.1041**	**2.5110**	**4.4600e-003**	**0.1111**	**0.1156**	**0.1735**	**0.0484**	**0.1154**	**0.1312**						**398.3200**

	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	**37.58**	**36.63**	**-4.40**	**0.00**	**46.36**	**37.21**	**42.07**	**51.50**	**32.95**	**39.18**	**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	**7-26-2018**	**10-25-2018**	1.8323	0.8570
2	**10-26-2018**	**1-25-2019**	0.9328	0.5893
3	**1-26-2019**	**4-25-2019**	0.8460	0.5715
4	**4-26-2019**	**7-25-2019**	0.8544	0.5769
5	**7-26-2019**	**10-25-2019**	0.8642	0.5836
6	**10-26-2019**	**1-25-2020**	0.6060	0.4523
7	**1-26-2020**	**4-25-2020**	0.3677	0.3544
		Highest	1.8323	0.8570

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	0.2787	7.0000e-005	8.0600e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005						0.0166
Energy	8.0600e-003	0.0732	0.0615	4.4000e-004		5.5700e-003	5.5700e-003		5.5700e-003	5.5700e-003						176.9009
Mobile	0.3821	4.4630	3.4293	0.0159	0.8559	0.0184	0.8743	0.2308	0.0175	0.2482						1,483.8893
Waste						0.0000	0.0000		0.0000	0.0000						68.8372
Water						0.0000	0.0000		0.0000	0.0000						8.3025
Total	**0.6689**	**4.5364**	**3.4989**	**0.0163**	**0.8559**	**0.0240**	**0.8799**	**0.2308**	**0.0231**	**0.2538**						**1,737.9465**

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	0.2787	7.0000e-005	8.0600e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005						0.0166
Energy	8.0600e-003	0.0732	0.0615	4.4000e-004		5.5700e-003	5.5700e-003		5.5700e-003	5.5700e-003						169.9621
Mobile	0.3821	4.4630	3.4293	0.0159	0.8559	0.0184	0.8743	0.2308	0.0175	0.2482						1,483.8893
Waste						0.0000	0.0000		0.0000	0.0000						34.4186
Water						0.0000	0.0000		0.0000	0.0000						7.1479
Total	**0.6689**	**4.5364**	**3.4989**	**0.0163**	**0.8559**	**0.0240**	**0.8799**	**0.2308**	**0.0231**	**0.2538**						**1,695.4345**

	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**	**2.45**

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	7/26/2018	8/22/2018	5	20	
2	Site Preparation	Site Preparation	8/23/2018	9/5/2018	5	10	
3	Grading	Grading	9/6/2018	10/24/2018	5	35	
4	Building Construction	Building Construction	10/25/2018	11/27/2019	5	285	
5	Paving	Paving	11/28/2019	12/25/2019	5	20	
6	Architectural Coating	Architectural Coating	1/1/2020	4/7/2020	5	70	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 87.5

Acres of Paving: 1.1

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 89,250; Non-Residential Outdoor: 29,750; Striped Parking Area: 2,928 (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	3	8.00	158	0.38
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Grading	Excavators	2	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	2	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	2	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
Grading	Scrapers	2	8.00	367	0.48
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	6	15.00	0.00	9.00	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	8	20.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	45.00	18.00	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	9.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Demolition - 2018

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					9.8000e-004	0.0000	9.8000e-004	1.5000e-004	0.0000	1.5000e-004						0.0000
Off-Road	0.0372	0.3832	0.2230	3.9000e-004		0.0194	0.0194		0.0181	0.0181						35.3660
Total	**0.0372**	**0.3832**	**0.2230**	**3.9000e-004**	**9.8000e-004**	**0.0194**	**0.0204**	**1.5000e-004**	**0.0181**	**0.0182**						**35.3660**

3.2 Demolition - 2018

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	4.0000e-005	1.4300e-003	1.9000e-004	0.0000	8.0000e-005	1.0000e-005	8.0000e-005	2.0000e-005	1.0000e-005	3.0000e-005						0.3514
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	7.9000e-004	5.3000e-004	5.3000e-003	1.0000e-005	1.2000e-003	1.0000e-005	1.2100e-003	3.2000e-004	1.0000e-005	3.3000e-004						1.1047
Total	**8.3000e-004**	**1.9600e-003**	**5.4900e-003**	**1.0000e-005**	**1.2800e-003**	**2.0000e-005**	**1.2900e-003**	**3.4000e-004**	**2.0000e-005**	**3.6000e-004**						**1.4562**

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					3.8000e-004	0.0000	3.8000e-004	6.0000e-005	0.0000	6.0000e-005						0.0000
Off-Road	9.2500e-003	0.1831	0.2467	3.9000e-004		8.6300e-003	8.6300e-003		8.6300e-003	8.6300e-003						35.3660
Total	**9.2500e-003**	**0.1831**	**0.2467**	**3.9000e-004**	**3.8000e-004**	**8.6300e-003**	**9.0100e-003**	**6.0000e-005**	**8.6300e-003**	**8.6900e-003**						**35.3660**

3.2 Demolition - 2018

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	4.0000e-005	1.4300e-003	1.9000e-004	0.0000	8.0000e-005	1.0000e-005	8.0000e-005	2.0000e-005	1.0000e-005	3.0000e-005						0.3514
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	7.9000e-004	5.3000e-004	5.3000e-003	1.0000e-005	1.2000e-003	1.0000e-005	1.2100e-003	3.2000e-004	1.0000e-005	3.3000e-004						1.1047
Total	**8.3000e-004**	**1.9600e-003**	**5.4900e-003**	**1.0000e-005**	**1.2800e-003**	**2.0000e-005**	**1.2900e-003**	**3.4000e-004**	**2.0000e-005**	**3.6000e-004**						**1.4562**

3.3 Site Preparation - 2018

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					0.0903	0.0000	0.0903	0.0497	0.0000	0.0497						0.0000
Off-Road	0.0228	0.2410	0.1124	1.9000e-004		0.0129	0.0129		0.0119	0.0119						17.5152
Total	**0.0228**	**0.2410**	**0.1124**	**1.9000e-004**	**0.0903**	**0.0129**	**0.1032**	**0.0497**	**0.0119**	**0.0615**						**17.5152**

3.3 Site Preparation - 2018

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
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	4.7000e-004	3.2000e-004	3.1800e-003	1.0000e-005	7.2000e-004	0.0000	7.2000e-004	1.9000e-004	0.0000	2.0000e-004						0.6628
Total	**4.7000e-004**	**3.2000e-004**	**3.1800e-003**	**1.0000e-005**	**7.2000e-004**	**0.0000**	**7.2000e-004**	**1.9000e-004**	**0.0000**	**2.0000e-004**						**0.6628**

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					0.0352	0.0000	0.0352	0.0194	0.0000	0.0194						0.0000
Off-Road	4.6600e-003	0.0953	0.1148	1.9000e-004		4.7300e-003	4.7300e-003		4.7300e-003	4.7300e-003						17.5152
Total	**4.6600e-003**	**0.0953**	**0.1148**	**1.9000e-004**	**0.0352**	**4.7300e-003**	**0.0400**	**0.0194**	**4.7300e-003**	**0.0241**						**17.5152**

3.3 Site Preparation - 2018

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
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	4.7000e-004	3.2000e-004	3.1800e-003	1.0000e-005	7.2000e-004	0.0000	7.2000e-004	1.9000e-004	0.0000	2.0000e-004						0.6628
Total	**4.7000e-004**	**3.2000e-004**	**3.1800e-003**	**1.0000e-005**	**7.2000e-004**	**0.0000**	**7.2000e-004**	**1.9000e-004**	**0.0000**	**2.0000e-004**						**0.6628**

3.4 Grading - 2018

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					0.1518	0.0000	0.1518	0.0629	0.0000	0.0629						0.0000
Off-Road	0.0891	1.0416	0.6141	1.0900e-003		0.0461	0.0461		0.0424	0.0424						99.9064
Total	**0.0891**	**1.0416**	**0.6141**	**1.0900e-003**	**0.1518**	**0.0461**	**0.1979**	**0.0629**	**0.0424**	**0.1053**						**99.9064**

3.4 Grading - 2018

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
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	1.8300e-003	1.2500e-003	0.0124	3.0000e-005	2.8000e-003	2.0000e-005	2.8200e-003	7.4000e-004	2.0000e-005	7.6000e-004						2.5777
Total	**1.8300e-003**	**1.2500e-003**	**0.0124**	**3.0000e-005**	**2.8000e-003**	**2.0000e-005**	**2.8200e-003**	**7.4000e-004**	**2.0000e-005**	**7.6000e-004**						**2.5777**

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					0.0592	0.0000	0.0592	0.0246	0.0000	0.0246						0.0000
Off-Road	0.0267	0.5246	0.6426	1.0900e-003		0.0227	0.0227		0.0227	0.0227						99.9063
Total	**0.0267**	**0.5246**	**0.6426**	**1.0900e-003**	**0.0592**	**0.0227**	**0.0819**	**0.0246**	**0.0227**	**0.0473**						**99.9063**

3.4 Grading - 2018

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
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	1.8300e-003	1.2500e-003	0.0124	3.0000e-005	2.8000e-003	2.0000e-005	2.8200e-003	7.4000e-004	2.0000e-005	7.6000e-004						2.5777
Total	**1.8300e-003**	**1.2500e-003**	**0.0124**	**3.0000e-005**	**2.8000e-003**	**2.0000e-005**	**2.8200e-003**	**7.4000e-004**	**2.0000e-005**	**7.6000e-004**						**2.5777**

3.5 Building Construction - 2018

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	0.0643	0.5614	0.4219	6.5000e-004		0.0360	0.0360		0.0338	0.0338						57.4137
Total	**0.0643**	**0.5614**	**0.4219**	**6.5000e-004**		**0.0360**	**0.0360**		**0.0338**	**0.0338**						**57.4137**

3.5 Building Construction - 2018

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
Vendor	2.2300e-003	0.0617	0.0112	1.2000e-004	2.8600e-003	5.0000e-004	3.3600e-003	8.3000e-004	4.8000e-004	1.3100e-003						11.8915
Worker	5.6500e-003	3.8500e-003	0.0382	9.0000e-005	8.6300e-003	6.0000e-005	8.6900e-003	2.2900e-003	5.0000e-005	2.3500e-003						7.9541
Total	**7.8800e-003**	**0.0656**	**0.0493**	**2.1000e-004**	**0.0115**	**5.6000e-004**	**0.0121**	**3.1200e-003**	**5.3000e-004**	**3.6600e-003**						**19.8456**

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	0.0162	0.3414	0.4290	6.5000e-004		0.0217	0.0217		0.0217	0.0217						57.4136
Total	**0.0162**	**0.3414**	**0.4290**	**6.5000e-004**		**0.0217**	**0.0217**		**0.0217**	**0.0217**						**57.4136**

3.5 Building Construction - 2018

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
Vendor	2.2300e-003	0.0617	0.0112	1.2000e-004	2.8600e-003	5.0000e-004	3.3600e-003	8.3000e-004	4.8000e-004	1.3100e-003						11.8915
Worker	5.6500e-003	3.8500e-003	0.0382	9.0000e-005	8.6300e-003	6.0000e-005	8.6900e-003	2.2900e-003	5.0000e-005	2.3500e-003						7.9541
Total	**7.8800e-003**	**0.0656**	**0.0493**	**2.1000e-004**	**0.0115**	**5.6000e-004**	**0.0121**	**3.1200e-003**	**5.3000e-004**	**3.6600e-003**						**19.8456**

3.5 Building Construction - 2019

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	0.2798	2.4978	2.0339	3.1900e-003		0.1529	0.1529		0.1437	0.1437						280.2952
Total	**0.2798**	**2.4978**	**2.0339**	**3.1900e-003**		**0.1529**	**0.1529**		**0.1437**	**0.1437**						**280.2952**

3.5 Building Construction - 2019

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
Vendor	9.8200e-003	0.2884	0.0492	6.1000e-004	0.0141	2.0900e-003	0.0162	4.0800e-003	2.0000e-003	6.0800e-003						58.2066
Worker	0.0252	0.0166	0.1662	4.2000e-004	0.0426	2.8000e-004	0.0429	0.0113	2.6000e-004	0.0116						38.1094
Total	**0.0350**	**0.3049**	**0.2153**	**1.0300e-003**	**0.0568**	**2.3700e-003**	**0.0591**	**0.0154**	**2.2600e-003**	**0.0177**						**96.3160**

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	0.0799	1.6858	2.1180	3.1900e-003		0.1071	0.1071		0.1071	0.1071						280.2949
Total	**0.0799**	**1.6858**	**2.1180**	**3.1900e-003**		**0.1071**	**0.1071**		**0.1071**	**0.1071**						**280.2949**

3.5 Building Construction - 2019

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
Vendor	9.8200e-003	0.2884	0.0492	6.1000e-004	0.0141	2.0900e-003	0.0162	4.0800e-003	2.0000e-003	6.0800e-003						58.2066
Worker	0.0252	0.0166	0.1662	4.2000e-004	0.0426	2.8000e-004	0.0429	0.0113	2.6000e-004	0.0116						38.1094
Total	**0.0350**	**0.3049**	**0.2153**	**1.0300e-003**	**0.0568**	**2.3700e-003**	**0.0591**	**0.0154**	**2.2600e-003**	**0.0177**						**96.3160**

3.6 Paving - 2019

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	0.0145	0.1524	0.1467	2.3000e-004		8.2500e-003	8.2500e-003		7.5900e-003	7.5900e-003						20.6371
Paving	1.4400e-003					0.0000	0.0000		0.0000	0.0000						0.0000
Total	**0.0160**	**0.1524**	**0.1467**	**2.3000e-004**		**8.2500e-003**	**8.2500e-003**		**7.5900e-003**	**7.5900e-003**						**20.6371**

3.6 Paving - 2019

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
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	7.1000e-004	4.7000e-004	4.6700e-003	1.0000e-005	1.2000e-003	1.0000e-005	1.2100e-003	3.2000e-004	1.0000e-005	3.3000e-004						1.0720
Total	**7.1000e-004**	**4.7000e-004**	**4.6700e-003**	**1.0000e-005**	**1.2000e-003**	**1.0000e-005**	**1.2100e-003**	**3.2000e-004**	**1.0000e-005**	**3.3000e-004**						**1.0720**

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	5.6100e-003	0.1130	0.1730	2.3000e-004		6.0900e-003	6.0900e-003		6.0900e-003	6.0900e-003						20.6371
Paving	1.4400e-003					0.0000	0.0000		0.0000	0.0000						0.0000
Total	**7.0500e-003**	**0.1130**	**0.1730**	**2.3000e-004**		**6.0900e-003**	**6.0900e-003**		**6.0900e-003**	**6.0900e-003**						**20.6371**

3.6 Paving - 2019

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
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	7.1000e-004	4.7000e-004	4.6700e-003	1.0000e-005	1.2000e-003	1.0000e-005	1.2100e-003	3.2000e-004	1.0000e-005	3.3000e-004						1.0720
Total	**7.1000e-004**	**4.7000e-004**	**4.6700e-003**	**1.0000e-005**	**1.2000e-003**	**1.0000e-005**	**1.2100e-003**	**3.2000e-004**	**1.0000e-005**	**3.3000e-004**						**1.0720**

3.7 Architectural Coating - 2020

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	0.4239					0.0000	0.0000		0.0000	0.0000						0.0000
Off-Road	8.4800e-003	0.0589	0.0641	1.0000e-004		3.8800e-003	3.8800e-003		3.8800e-003	3.8800e-003						8.9537
Total	**0.4323**	**0.0589**	**0.0641**	**1.0000e-004**		**3.8800e-003**	**3.8800e-003**		**3.8800e-003**	**3.8800e-003**						**8.9537**

3.7 Architectural Coating - 2020

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
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	1.3600e-003	8.6000e-004	8.7600e-003	2.0000e-005	2.5200e-003	2.0000e-005	2.5300e-003	6.7000e-004	1.0000e-005	6.8000e-004						2.1811
Total	**1.3600e-003**	**8.6000e-004**	**8.7600e-003**	**2.0000e-005**	**2.5200e-003**	**2.0000e-005**	**2.5300e-003**	**6.7000e-004**	**1.0000e-005**	**6.8000e-004**						**2.1811**

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	0.4239					0.0000	0.0000		0.0000	0.0000						0.0000
Off-Road	2.0800e-003	0.0475	0.0641	1.0000e-004		3.3300e-003	3.3300e-003		3.3300e-003	3.3300e-003						8.9537
Total	**0.4259**	**0.0475**	**0.0641**	**1.0000e-004**		**3.3300e-003**	**3.3300e-003**		**3.3300e-003**	**3.3300e-003**						**8.9537**

3.7 Architectural Coating - 2020

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
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	1.3600e-003	8.6000e-004	8.7600e-003	2.0000e-005	2.5200e-003	2.0000e-005	2.5300e-003	6.7000e-004	1.0000e-005	6.8000e-004						2.1811
Total	**1.3600e-003**	**8.6000e-004**	**8.7600e-003**	**2.0000e-005**	**2.5200e-003**	**2.0000e-005**	**2.5300e-003**	**6.7000e-004**	**1.0000e-005**	**6.8000e-004**						**2.1811**

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	0.3821	4.4630	3.4293	0.0159	0.8559	0.0184	0.8743	0.2308	0.0175	0.2482						1,483.889 3
Unmitigated	0.3821	4.4630	3.4293	0.0159	0.8559	0.0184	0.8743	0.2308	0.0175	0.2482						1,483.889 3

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Elementary School	1,417.50	0.00	0.00	2,232,501	2,232,501
Parking Lot	0.00	0.00	0.00		
Total	1,417.50	0.00	0.00	2,232,501	2,232,501

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
Elementary School	9.50	7.30	7.30	65.00	30.00	5.00	63	25	12
Parking Lot	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
Elementary School	0.481390	0.032808	0.168621	0.127212	0.018382	0.004997	0.032622	0.122881	0.002369	0.001675	0.005261	0.001115	0.000667
Parking Lot	0.481390	0.032808	0.168621	0.127212	0.018382	0.004997	0.032622	0.122881	0.002369	0.001675	0.005261	0.001115	0.000667

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Install High Efficiency Lighting

	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						89.7604
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000						96.6991
NaturalGas Mitigated	8.0600e-003	0.0732	0.0615	4.4000e-004		5.5700e-003	5.5700e-003		5.5700e-003	5.5700e-003						80.2017
NaturalGas Unmitigated	8.0600e-003	0.0732	0.0615	4.4000e-004		5.5700e-003	5.5700e-003		5.5700e-003	5.5700e-003						80.2017

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					
Elementary School	1.49405e +006	8.0600e-003	0.0732	0.0615	4.4000e-004		5.5700e-003	5.5700e-003		5.5700e-003	5.5700e-003						80.2017
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						0.0000
Total		**8.0600e-003**	**0.0732**	**0.0615**	**4.4000e-004**		**5.5700e-003**	**5.5700e-003**		**5.5700e-003**	**5.5700e-003**						**80.2017**

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					
Elementary School	1.49405e +006	8.0600e-003	0.0732	0.0615	4.4000e-004		5.5700e-003	5.5700e-003		5.5700e-003	5.5700e-003						80.2017
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						0.0000
Total		**8.0600e-003**	**0.0732**	**0.0615**	**4.4000e-004**		**5.5700e-003**	**5.5700e-003**		**5.5700e-003**	**5.5700e-003**						**80.2017**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Elementary School	417690				92.9003
Parking Lot	17080				3.7988
Total					**96.6992**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Elementary School	389225				86.5693
Parking Lot	14347.2				3.1910
Total					**89.7604**

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	0.2787	7.0000e-005	8.0600e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005						0.0166
Unmitigated	0.2787	7.0000e-005	8.0600e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005						0.0166

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	0.0424					0.0000	0.0000		0.0000	0.0000						0.0000
Consumer Products	0.2355					0.0000	0.0000		0.0000	0.0000						0.0000
Landscaping	7.6000e-004	7.0000e-005	8.0600e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005						0.0166
Total	**0.2787**	**7.0000e-005**	**8.0600e-003**	**0.0000**		**3.0000e-005**	**3.0000e-005**		**3.0000e-005**	**3.0000e-005**						**0.0166**

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	0.0424					0.0000	0.0000		0.0000	0.0000						0.0000
Consumer Products	0.2355					0.0000	0.0000		0.0000	0.0000						0.0000
Landscaping	7.6000e-004	7.0000e-005	8.0600e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005						0.0166
Total	**0.2787**	**7.0000e-005**	**8.0600e-003**	**0.0000**		**3.0000e-005**	**3.0000e-005**		**3.0000e-005**	**3.0000e-005**						**0.0166**

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				7.1479
Unmitigated				8.3025

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Elementary School	1.81818 / 4.67532				8.3025
Parking Lot	0 / 0				0.0000
Total					**8.3025**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Elementary School	1.45454 / 4.39013				7.1479
Parking Lot	0 / 0				0.0000
Total					**7.1479**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Institute Recycling and Composting Services

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated				34.4186
Unmitigated				68.8372

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Elementary School	136.88				68.8372
Parking Lot	0				0.0000
Total					**68.8372**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Elementary School	68.44				34.4186
Parking Lot	0				0.0000
Total					**34.4186**

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

CUSD Fowler-McKinley ES

Fresno County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Elementary School	750.00	Student	22.00	59,500.00	800
Parking Lot	122.00	Space	1.10	48,800.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	45
Climate Zone	3			**Operational Year**	2030
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	364.4	**CH4 Intensity (lb/MWhr)**	0.016	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Includes RPS adjustment

Land Use - 750 students. 50 staff. 22 acres. assumes 122 space parking lot per equivalent sized school project.

Construction Phase - Based on model defaults. Building phase based on construction information for a similar sized school. Arch coating assumed to occur over last quarter of building phase (70 days) based on similar school construction project.

Off-road Equipment - Equipment based on model defaults.

Grading - Based on model defaults.

Demolition - Assumes 2,000 sf to be demolished

Trips and VMT - Based on model defaults.

On-road Fugitive Dust - Based on model defaults.

Architectural Coating - Based on model defaults.

Vehicle Trips - 1.89 trips/student per traffic analysis

Vehicle Emission Factors - Based on model defaults.

Vehicle Emission Factors -

Vehicle Emission Factors -

Road Dust - Based on model defaults.

Consumer Products - Based on model defaults.

Area Coating - Based on model defaults.

Landscape Equipment - Based on model defaults.

Energy Use - Based on model defaults. includes RPS adjustment

Water And Wastewater - Based on model defaults.

Solid Waste - Based on model defaults.

Construction Off-road Equipment Mitigation - Includes T3 equipment, 50% CE for watering unpaved travel surfaces, 61%CE for watering exposed surfaces, onsite speed limit of 15 mph

Area Mitigation -

Energy Mitigation - Includes installation of high efficiency lighting

Water Mitigation - Includes installation of low-flow water fixtures and water-efficient irrigation systems

Waste Mitigation - Assumes min 50% diversion rate per statewide average

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	6.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	9.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3

tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstructionPhase	NumDays	20.00	70.00
tblConstructionPhase	NumDays	370.00	285.00
tblConstructionPhase	PhaseEndDate	5/20/2020	4/7/2020
tblConstructionPhase	PhaseEndDate	3/25/2020	11/27/2019
tblConstructionPhase	PhaseEndDate	4/22/2020	12/25/2019
tblConstructionPhase	PhaseStartDate	4/23/2020	1/1/2020
tblConstructionPhase	PhaseStartDate	3/26/2020	11/28/2019
tblLandUse	LandUseSquareFeet	62,702.53	59,500.00
tblLandUse	LotAcreage	1.44	22.00
tblLandUse	Population	0.00	800.00
tblProjectCharacteristics	CH4IntensityFactor	0.029	0.016
tblProjectCharacteristics	CO2IntensityFactor	641.35	364.4
tblProjectCharacteristics	N2OIntensityFactor	0.006	0.004
tblVehicleTrips	WD_TR	1.29	1.89

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					
2018	0.2244	2.2963	1.4418	2.5700e-003	0.2594	0.1150	0.3744	0.1171	0.1067	0.2239						234.7437
2019	0.3315	2.9557	2.4006	4.4600e-003	0.0580	0.1635	0.2214	0.0157	0.1536	0.1693						398.3204
2020	0.4337	0.0598	0.0729	1.3000e-004	2.5200e-003	3.9000e-003	6.4200e-003	6.7000e-004	3.9000e-003	4.5700e-003						11.1348
Maximum	**0.4337**	**2.9557**	**2.4006**	**4.4600e-003**	**0.2594**	**0.1635**	**0.3744**	**0.1171**	**0.1536**	**0.2239**						**398.3204**

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					
2018	0.0678	1.2136	1.5035	2.5700e-003	0.1111	0.0584	0.1695	0.0484	0.0584	0.1067						234.7434
2019	0.1226	2.1041	2.5110	4.4600e-003	0.0580	0.1156	0.1735	0.0157	0.1154	0.1312						398.3200
2020	0.4273	0.0484	0.0729	1.3000e-004	2.5200e-003	3.3400e-003	5.8600e-003	6.7000e-004	3.3400e-003	4.0100e-003						11.1347
Maximum	**0.4273**	**2.1041**	**2.5110**	**4.4600e-003**	**0.1111**	**0.1156**	**0.1735**	**0.0484**	**0.1154**	**0.1312**						**398.3200**

	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	**37.58**	**36.63**	**-4.40**	**0.00**	**46.36**	**37.21**	**42.07**	**51.50**	**32.95**	**39.18**	**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	**7-26-2018**	**10-25-2018**	1.8323	0.8570
2	**10-26-2018**	**1-25-2019**	0.9328	0.5893
3	**1-26-2019**	**4-25-2019**	0.8460	0.5715
4	**4-26-2019**	**7-25-2019**	0.8544	0.5769
5	**7-26-2019**	**10-25-2019**	0.8642	0.5836
6	**10-26-2019**	**1-25-2020**	0.6060	0.4523
7	**1-26-2020**	**4-25-2020**	0.3677	0.3544
		Highest	1.8323	0.8570

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	0.2787	7.0000e-005	7.9700e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005						0.0166
Energy	8.0600e-003	0.0732	0.0615	4.4000e-004		5.5700e-003	5.5700e-003		5.5700e-003	5.5700e-003						152.3784
Mobile	0.1973	2.8182	1.7374	0.0131	0.8549	5.8500e-003	0.8607	0.2303	5.4800e-003	0.2357						1,224.9285
Waste						0.0000	0.0000		0.0000	0.0000						68.8372
Water						0.0000	0.0000		0.0000	0.0000						6.8246
Total	**0.4840**	**2.8915**	**1.8069**	**0.0135**	**0.8549**	**0.0115**	**0.8663**	**0.2303**	**0.0111**	**0.2413**						**1,452.9853**

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	0.2787	7.0000e-005	7.9700e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005						0.0166
Energy	8.0600e-003	0.0732	0.0615	4.4000e-004		5.5700e-003	5.5700e-003		5.5700e-003	5.5700e-003						147.1992
Mobile	0.1973	2.8182	1.7374	0.0131	0.8549	5.8500e-003	0.8607	0.2303	5.4800e-003	0.2357						1,224.9285
Waste						0.0000	0.0000		0.0000	0.0000						34.4186
Water						0.0000	0.0000		0.0000	0.0000						5.8373
Total	**0.4840**	**2.8915**	**1.8069**	**0.0135**	**0.8549**	**0.0115**	**0.8663**	**0.2303**	**0.0111**	**0.2413**						**1,412.4002**

	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**	**2.79**

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	7/26/2018	8/22/2018	5	20	
2	Site Preparation	Site Preparation	8/23/2018	9/5/2018	5	10	
3	Grading	Grading	9/6/2018	10/24/2018	5	35	
4	Building Construction	Building Construction	10/25/2018	11/27/2019	5	285	
5	Paving	Paving	11/28/2019	12/25/2019	5	20	
6	Architectural Coating	Architectural Coating	1/1/2020	4/7/2020	5	70	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 87.5

Acres of Paving: 1.1

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 89,250; Non-Residential Outdoor: 29,750; Striped Parking Area: 2,928 (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	3	8.00	158	0.38
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Grading	Excavators	2	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	2	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	2	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
Grading	Scrapers	2	8.00	367	0.48
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	6	15.00	0.00	9.00	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	8	20.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	45.00	18.00	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	9.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Demolition - 2018

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					9.8000e-004	0.0000	9.8000e-004	1.5000e-004	0.0000	1.5000e-004						0.0000
Off-Road	0.0372	0.3832	0.2230	3.9000e-004		0.0194	0.0194		0.0181	0.0181						35.3660
Total	**0.0372**	**0.3832**	**0.2230**	**3.9000e-004**	**9.8000e-004**	**0.0194**	**0.0204**	**1.5000e-004**	**0.0181**	**0.0182**						**35.3660**

3.2 Demolition - 2018

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	4.0000e-005	1.4300e-003	1.9000e-004	0.0000	8.0000e-005	1.0000e-005	8.0000e-005	2.0000e-005	1.0000e-005	3.0000e-005						0.3514
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	7.9000e-004	5.3000e-004	5.3000e-003	1.0000e-005	1.2000e-003	1.0000e-005	1.2100e-003	3.2000e-004	1.0000e-005	3.3000e-004						1.1047
Total	**8.3000e-004**	**1.9600e-003**	**5.4900e-003**	**1.0000e-005**	**1.2800e-003**	**2.0000e-005**	**1.2900e-003**	**3.4000e-004**	**2.0000e-005**	**3.6000e-004**						**1.4562**

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					3.8000e-004	0.0000	3.8000e-004	6.0000e-005	0.0000	6.0000e-005						0.0000
Off-Road	9.2500e-003	0.1831	0.2467	3.9000e-004		8.6300e-003	8.6300e-003		8.6300e-003	8.6300e-003						35.3660
Total	**9.2500e-003**	**0.1831**	**0.2467**	**3.9000e-004**	**3.8000e-004**	**8.6300e-003**	**9.0100e-003**	**6.0000e-005**	**8.6300e-003**	**8.6900e-003**						**35.3660**

3.2 Demolition - 2018

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	4.0000e-005	1.4300e-003	1.9000e-004	0.0000	8.0000e-005	1.0000e-005	8.0000e-005	2.0000e-005	1.0000e-005	3.0000e-005						0.3514
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	7.9000e-004	5.3000e-004	5.3000e-003	1.0000e-005	1.2000e-003	1.0000e-005	1.2100e-003	3.2000e-004	1.0000e-005	3.3000e-004						1.1047
Total	**8.3000e-004**	**1.9600e-003**	**5.4900e-003**	**1.0000e-005**	**1.2800e-003**	**2.0000e-005**	**1.2900e-003**	**3.4000e-004**	**2.0000e-005**	**3.6000e-004**						**1.4562**

3.3 Site Preparation - 2018

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					0.0903	0.0000	0.0903	0.0497	0.0000	0.0497						0.0000
Off-Road	0.0228	0.2410	0.1124	1.9000e-004		0.0129	0.0129		0.0119	0.0119						17.5152
Total	**0.0228**	**0.2410**	**0.1124**	**1.9000e-004**	**0.0903**	**0.0129**	**0.1032**	**0.0497**	**0.0119**	**0.0615**						**17.5152**

3.3 Site Preparation - 2018

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
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	4.7000e-004	3.2000e-004	3.1800e-003	1.0000e-005	7.2000e-004	0.0000	7.2000e-004	1.9000e-004	0.0000	2.0000e-004						0.6628
Total	**4.7000e-004**	**3.2000e-004**	**3.1800e-003**	**1.0000e-005**	**7.2000e-004**	**0.0000**	**7.2000e-004**	**1.9000e-004**	**0.0000**	**2.0000e-004**						**0.6628**

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					0.0352	0.0000	0.0352	0.0194	0.0000	0.0194						0.0000
Off-Road	4.6600e-003	0.0953	0.1148	1.9000e-004		4.7300e-003	4.7300e-003		4.7300e-003	4.7300e-003						17.5152
Total	**4.6600e-003**	**0.0953**	**0.1148**	**1.9000e-004**	**0.0352**	**4.7300e-003**	**0.0400**	**0.0194**	**4.7300e-003**	**0.0241**						**17.5152**

3.3 Site Preparation - 2018

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
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	4.7000e-004	3.2000e-004	3.1800e-003	1.0000e-005	7.2000e-004	0.0000	7.2000e-004	1.9000e-004	0.0000	2.0000e-004						0.6628
Total	**4.7000e-004**	**3.2000e-004**	**3.1800e-003**	**1.0000e-005**	**7.2000e-004**	**0.0000**	**7.2000e-004**	**1.9000e-004**	**0.0000**	**2.0000e-004**						**0.6628**

3.4 Grading - 2018

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					0.1518	0.0000	0.1518	0.0629	0.0000	0.0629						0.0000
Off-Road	0.0891	1.0416	0.6141	1.0900e-003		0.0461	0.0461		0.0424	0.0424						99.9064
Total	**0.0891**	**1.0416**	**0.6141**	**1.0900e-003**	**0.1518**	**0.0461**	**0.1979**	**0.0629**	**0.0424**	**0.1053**						**99.9064**

3.4 Grading - 2018

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
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	1.8300e-003	1.2500e-003	0.0124	3.0000e-005	2.8000e-003	2.0000e-005	2.8200e-003	7.4000e-004	2.0000e-005	7.6000e-004						2.5777
Total	**1.8300e-003**	**1.2500e-003**	**0.0124**	**3.0000e-005**	**2.8000e-003**	**2.0000e-005**	**2.8200e-003**	**7.4000e-004**	**2.0000e-005**	**7.6000e-004**						**2.5777**

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					0.0592	0.0000	0.0592	0.0246	0.0000	0.0246						0.0000
Off-Road	0.0267	0.5246	0.6426	1.0900e-003		0.0227	0.0227		0.0227	0.0227						99.9063
Total	**0.0267**	**0.5246**	**0.6426**	**1.0900e-003**	**0.0592**	**0.0227**	**0.0819**	**0.0246**	**0.0227**	**0.0473**						**99.9063**

3.4 Grading - 2018

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
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	1.8300e-003	1.2500e-003	0.0124	3.0000e-005	2.8000e-003	2.0000e-005	2.8200e-003	7.4000e-004	2.0000e-005	7.6000e-004						2.5777
Total	**1.8300e-003**	**1.2500e-003**	**0.0124**	**3.0000e-005**	**2.8000e-003**	**2.0000e-005**	**2.8200e-003**	**7.4000e-004**	**2.0000e-005**	**7.6000e-004**						**2.5777**

3.5 Building Construction - 2018

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	0.0643	0.5614	0.4219	6.5000e-004		0.0360	0.0360		0.0338	0.0338						57.4137
Total	**0.0643**	**0.5614**	**0.4219**	**6.5000e-004**		**0.0360**	**0.0360**		**0.0338**	**0.0338**						**57.4137**

3.5 Building Construction - 2018

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
Vendor	2.2300e-003	0.0617	0.0112	1.2000e-004	2.8600e-003	5.0000e-004	3.3600e-003	8.3000e-004	4.8000e-004	1.3100e-003						11.8915
Worker	5.6500e-003	3.8500e-003	0.0382	9.0000e-005	8.6300e-003	6.0000e-005	8.6900e-003	2.2900e-003	5.0000e-005	2.3500e-003						7.9541
Total	**7.8800e-003**	**0.0656**	**0.0493**	**2.1000e-004**	**0.0115**	**5.6000e-004**	**0.0121**	**3.1200e-003**	**5.3000e-004**	**3.6600e-003**						**19.8456**

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	0.0162	0.3414	0.4290	6.5000e-004		0.0217	0.0217		0.0217	0.0217						57.4136
Total	**0.0162**	**0.3414**	**0.4290**	**6.5000e-004**		**0.0217**	**0.0217**		**0.0217**	**0.0217**						**57.4136**

3.5 Building Construction - 2018

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
Vendor	2.2300e-003	0.0617	0.0112	1.2000e-004	2.8600e-003	5.0000e-004	3.3600e-003	8.3000e-004	4.8000e-004	1.3100e-003						11.8915
Worker	5.6500e-003	3.8500e-003	0.0382	9.0000e-005	8.6300e-003	6.0000e-005	8.6900e-003	2.2900e-003	5.0000e-005	2.3500e-003						7.9541
Total	**7.8800e-003**	**0.0656**	**0.0493**	**2.1000e-004**	**0.0115**	**5.6000e-004**	**0.0121**	**3.1200e-003**	**5.3000e-004**	**3.6600e-003**						**19.8456**

3.5 Building Construction - 2019

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	0.2798	2.4978	2.0339	3.1900e-003		0.1529	0.1529		0.1437	0.1437						280.2952
Total	**0.2798**	**2.4978**	**2.0339**	**3.1900e-003**		**0.1529**	**0.1529**		**0.1437**	**0.1437**						**280.2952**

3.5 Building Construction - 2019

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
Vendor	9.8200e-003	0.2884	0.0492	6.1000e-004	0.0141	2.0900e-003	0.0162	4.0800e-003	2.0000e-003	6.0800e-003						58.2066
Worker	0.0252	0.0166	0.1662	4.2000e-004	0.0426	2.8000e-004	0.0429	0.0113	2.6000e-004	0.0116						38.1094
Total	**0.0350**	**0.3049**	**0.2153**	**1.0300e-003**	**0.0568**	**2.3700e-003**	**0.0591**	**0.0154**	**2.2600e-003**	**0.0177**						**96.3160**

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	0.0799	1.6858	2.1180	3.1900e-003		0.1071	0.1071		0.1071	0.1071						280.2949
Total	**0.0799**	**1.6858**	**2.1180**	**3.1900e-003**		**0.1071**	**0.1071**		**0.1071**	**0.1071**						**280.2949**

3.5 Building Construction - 2019

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
Vendor	9.8200e-003	0.2884	0.0492	6.1000e-004	0.0141	2.0900e-003	0.0162	4.0800e-003	2.0000e-003	6.0800e-003						58.2066
Worker	0.0252	0.0166	0.1662	4.2000e-004	0.0426	2.8000e-004	0.0429	0.0113	2.6000e-004	0.0116						38.1094
Total	**0.0350**	**0.3049**	**0.2153**	**1.0300e-003**	**0.0568**	**2.3700e-003**	**0.0591**	**0.0154**	**2.2600e-003**	**0.0177**						**96.3160**

3.6 Paving - 2019

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	0.0145	0.1524	0.1467	2.3000e-004		8.2500e-003	8.2500e-003		7.5900e-003	7.5900e-003						20.6371
Paving	1.4400e-003					0.0000	0.0000		0.0000	0.0000						0.0000
Total	**0.0160**	**0.1524**	**0.1467**	**2.3000e-004**		**8.2500e-003**	**8.2500e-003**		**7.5900e-003**	**7.5900e-003**						**20.6371**

3.6 Paving - 2019

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
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	7.1000e-004	4.7000e-004	4.6700e-003	1.0000e-005	1.2000e-003	1.0000e-005	1.2100e-003	3.2000e-004	1.0000e-005	3.3000e-004						1.0720
Total	**7.1000e-004**	**4.7000e-004**	**4.6700e-003**	**1.0000e-005**	**1.2000e-003**	**1.0000e-005**	**1.2100e-003**	**3.2000e-004**	**1.0000e-005**	**3.3000e-004**						**1.0720**

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	5.6100e-003	0.1130	0.1730	2.3000e-004		6.0900e-003	6.0900e-003		6.0900e-003	6.0900e-003						20.6371
Paving	1.4400e-003					0.0000	0.0000		0.0000	0.0000						0.0000
Total	**7.0500e-003**	**0.1130**	**0.1730**	**2.3000e-004**		**6.0900e-003**	**6.0900e-003**		**6.0900e-003**	**6.0900e-003**						**20.6371**

3.6 Paving - 2019

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
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	7.1000e-004	4.7000e-004	4.6700e-003	1.0000e-005	1.2000e-003	1.0000e-005	1.2100e-003	3.2000e-004	1.0000e-005	3.3000e-004						1.0720
Total	**7.1000e-004**	**4.7000e-004**	**4.6700e-003**	**1.0000e-005**	**1.2000e-003**	**1.0000e-005**	**1.2100e-003**	**3.2000e-004**	**1.0000e-005**	**3.3000e-004**						**1.0720**

3.7 Architectural Coating - 2020

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	0.4239					0.0000	0.0000		0.0000	0.0000						0.0000
Off-Road	8.4800e-003	0.0589	0.0641	1.0000e-004		3.8800e-003	3.8800e-003		3.8800e-003	3.8800e-003						8.9537
Total	**0.4323**	**0.0589**	**0.0641**	**1.0000e-004**		**3.8800e-003**	**3.8800e-003**		**3.8800e-003**	**3.8800e-003**						**8.9537**

3.7 Architectural Coating - 2020

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
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	1.3600e-003	8.6000e-004	8.7600e-003	2.0000e-005	2.5200e-003	2.0000e-005	2.5300e-003	6.7000e-004	1.0000e-005	6.8000e-004						2.1811
Total	**1.3600e-003**	**8.6000e-004**	**8.7600e-003**	**2.0000e-005**	**2.5200e-003**	**2.0000e-005**	**2.5300e-003**	**6.7000e-004**	**1.0000e-005**	**6.8000e-004**						**2.1811**

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	0.4239					0.0000	0.0000		0.0000	0.0000						0.0000
Off-Road	2.0800e-003	0.0475	0.0641	1.0000e-004		3.3300e-003	3.3300e-003		3.3300e-003	3.3300e-003						8.9537
Total	**0.4259**	**0.0475**	**0.0641**	**1.0000e-004**		**3.3300e-003**	**3.3300e-003**		**3.3300e-003**	**3.3300e-003**						**8.9537**

3.7 Architectural Coating - 2020

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
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						0.0000
Worker	1.3600e-003	8.6000e-004	8.7600e-003	2.0000e-005	2.5200e-003	2.0000e-005	2.5300e-003	6.7000e-004	1.0000e-005	6.8000e-004						2.1811
Total	**1.3600e-003**	**8.6000e-004**	**8.7600e-003**	**2.0000e-005**	**2.5200e-003**	**2.0000e-005**	**2.5300e-003**	**6.7000e-004**	**1.0000e-005**	**6.8000e-004**						**2.1811**

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	0.1973	2.8182	1.7374	0.0131	0.8549	5.8500e-003	0.8607	0.2303	5.4800e-003	0.2357						1,224.928 5
Unmitigated	0.1973	2.8182	1.7374	0.0131	0.8549	5.8500e-003	0.8607	0.2303	5.4800e-003	0.2357						1,224.928 5

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Elementary School	1,417.50	0.00	0.00	2,232,501	2,232,501
Parking Lot	0.00	0.00	0.00		
Total	1,417.50	0.00	0.00	2,232,501	2,232,501

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
Elementary School	9.50	7.30	7.30	65.00	30.00	5.00	63	25	12
Parking Lot	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
Elementary School	0.517186	0.028486	0.175263	0.093589	0.009700	0.003404	0.033644	0.129242	0.002306	0.001185	0.004563	0.000998	0.000436
Parking Lot	0.517186	0.028486	0.175263	0.093589	0.009700	0.003404	0.033644	0.129242	0.002306	0.001185	0.004563	0.000998	0.000436

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Install High Efficiency Lighting

	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						66.9975
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000						72.1767
NaturalGas Mitigated	8.0600e-003	0.0732	0.0615	4.4000e-004		5.5700e-003	5.5700e-003		5.5700e-003	5.5700e-003						80.2017
NaturalGas Unmitigated	8.0600e-003	0.0732	0.0615	4.4000e-004		5.5700e-003	5.5700e-003		5.5700e-003	5.5700e-003						80.2017

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					
Elementary School	1.49405e+006	8.0600e-003	0.0732	0.0615	4.4000e-004		5.5700e-003	5.5700e-003		5.5700e-003	5.5700e-003						80.2017
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						0.0000
Total		**8.0600e-003**	**0.0732**	**0.0615**	**4.4000e-004**		**5.5700e-003**	**5.5700e-003**		**5.5700e-003**	**5.5700e-003**						**80.2017**

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					
Elementary School	1.49405e+006	8.0600e-003	0.0732	0.0615	4.4000e-004		5.5700e-003	5.5700e-003		5.5700e-003	5.5700e-003						80.2017
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						0.0000
Total		**8.0600e-003**	**0.0732**	**0.0615**	**4.4000e-004**		**5.5700e-003**	**5.5700e-003**		**5.5700e-003**	**5.5700e-003**						**80.2017**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Elementary School	417690				69.3412
Parking Lot	17080				2.8355
Total					**72.1767**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Elementary School	389225				64.6157
Parking Lot	14347.2				2.3818
Total					**66.9975**

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	0.2787	7.0000e-005	7.9700e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005						0.0166
Unmitigated	0.2787	7.0000e-005	7.9700e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005						0.0166

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	0.0424					0.0000	0.0000		0.0000	0.0000						0.0000
Consumer Products	0.2355					0.0000	0.0000		0.0000	0.0000						0.0000
Landscaping	7.3000e-004	7.0000e-005	7.9700e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005						0.0166
Total	**0.2787**	**7.0000e-005**	**7.9700e-003**	**0.0000**		**3.0000e-005**	**3.0000e-005**		**3.0000e-005**	**3.0000e-005**						**0.0166**

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	0.0424					0.0000	0.0000		0.0000	0.0000						0.0000
Consumer Products	0.2355					0.0000	0.0000		0.0000	0.0000						0.0000
Landscaping	7.3000e-004	7.0000e-005	7.9700e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005						0.0166
Total	**0.2787**	**7.0000e-005**	**7.9700e-003**	**0.0000**		**3.0000e-005**	**3.0000e-005**		**3.0000e-005**	**3.0000e-005**						**0.0166**

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				5.8373
Unmitigated				6.8246

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Elementary School	1.81818 / 4.67532				6.8246
Parking Lot	0 / 0				0.0000
Total					**6.8246**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Elementary School	1.45454 / 4.39013				5.8373
Parking Lot	0 / 0				0.0000
Total					**5.8373**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Institute Recycling and Composting Services

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated				34.4186
Unmitigated				68.8372

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Elementary School	136.88				68.8372
Parking Lot	0				0.0000
Total					**68.8372**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Elementary School	68.44				34.4186
Parking Lot	0				0.0000
Total					**34.4186**

9.0 Operational Offroad

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

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

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

Boilers

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

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Appendix 2

Biological Resources Assessment

Biological Resources Assessment

Fowler-McKinley Elementary School Project
Clovis Unified School District

Prepared by

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July 22, 2018

Purpose of the Study

The purpose of this assessment is to determine if the project may have a significant impact on the biological resources in the vicinity and to identify design, operational, or other measures that may be available to reduce or avoid the impacts. The following biological resources report consists of a description of the results of the assessment, including habitat types present, species descriptions for special status species that have the potential to occur, potential significant impacts the project could have on these species and their habitats, recommendations for further focused species surveys, if necessary, and avoidance or minimization measures that would reduce or eliminate any project impacts on these species.

Project Description and Background

The proposed Fowler McKinley Elementary School Project (project) includes the acquisition of a 22-acre school site and the construction and operation of an elementary school on the site. The site is located on the northeast corner of Fowler Avenue and the McKinley Avenue alignment, near the city limits of Fresno in Fresno County (Figures 1 & 2). The project ranges in elevation from 336 to 339 feet above mean sea level and is located in a portion of Section 27, Township 13 South, Range 21 East, M.D.B. & M., as shown on the Clovis, California Quadrangle 7.5 Minute Series USGS Map (Topographic). The existing land uses adjacent to the project area consist of single family residential, rural residences, orchard, ponding basin, and vacant land.

The proposed elementary school would serve up to 750 students in grades TK-6. The campus would have approximately 28 classrooms, administrative offices, a multi-purpose building, hardcourt areas and athletic fields that could potentially be lighted. The school would have approximately fifty employees, including administrators, faculty, and support staff. The school would be in regular session on weekdays from late August to early June, but may host special events and classes during evenings, on weekends, and during summer recess. The project includes annexation of the site to the City of Fresno. The timing for construction of the school would depend on enrollment growth and funding availability. The District estimates that school could be constructed in approximately five years.

Assessment Methods

A background search and literature review of all existing data pertaining to biological resources within the area was conducted. This included searching *California Natural Diversity Data Base* (CDFW 2018), the *Inventory of Rare and Endangered Vascular Plants of California* (CNPS 2018), the U.S. Fish and Wildlife Service *IPac Trust Resource List* (see Appendices), other available CEQA/NEPA documents, herbaria records, maps, and photographs. To ensure completeness of the search, a nine-quad radius was used for database queries, centered on the Clovis 7.5" USGS Quadrangle (Figure 3). From this review, a list of potentially occurring special status species was compiled for the project (see Appendices). Special status biological resources include special-status plant and wildlife species (including State or Federally designated, rare, threatened, endangered, Migratory Bird Treaty Act species, species of concern, or unique species); potential wetland/riparian habitats; sensitive plant communities; and other environmentally sensitive habitat areas.

On March 11, 2018, a reconnaissance-level site visit was conducted within the project footprint and a 100-foot radius buffer (study area), where accessible, to assess potential special status biological resources. The project site was surveyed on foot and evaluated to determine its ability to support the special status species under consideration. Wildlife observations, plant species, and habitat types encountered were documented. Focus was placed on searching for large burrows or burrow complexes and any potential wetland features, as well as potential wildlife corridors.

Environmental Setting

Existing Conditions

The project site is within San Joaquin Valley subregion of the California Floristic Province (Baldwin et al. 2012). Topography of the vicinity is relatively flat, without large elevation changes. There is only one soil type within the project area, Ramona loam (Figure 4) (NRCS 2018). This soil type is typically found on stream terraces on valleys. The alluvium is derived from granite and is well drained and not hydric. Ramona loam is slightly acidic to slightly alkaline. Due to human land alteration within the project area and vicinity (road construction, intensive agriculture, residential development), the native soils have been altered resulting in the absence of some of the typical characteristics, or possibility of hydric components.

Located between the Coast Range and the Sierra Nevada, the San Joaquin Valley has dry, hot summers and cool winters. The Fresno/Clovis area has a mean annual rainfall of 11 inches and average temperatures of 63 ºF (Average range: 50-76 ºF) (Western Regional Climate Center 2015).

In general, this area of Fresno County is rapidly developing to urban and residential uses, however residual agricultural and rural residential uses remain in the vicinity. With the development of the area, more urban influences also are prevalent, including frequent human disturbance, feral animals, rodent poisoning, and debris. Adjacent land uses include an equipment storage yard, rural residential, and developed single family residential to the north, agricultural land (vines, orchards, row crops) and rural residential to the west, east and south. Also, a ponding basin and canal (Mill Ditch) are to the south.

The approximately 22-acre project site consisted of primarily active agricultural land. At the time of the survey, crop included mostly row crops such as mustard, cruciferous vegetables, onions, corn and peppers, in part. The project is regularly disked for crop production and vegetation control. Dirt access roads crisscross the project area. No aquatic features were present. Habitat present within the project footprint was classified as developed (agricultural land and rural residential). Three houses were on the property, as well as several agricultural support buildings, a farm stand, farming debris, and trash. One of the houses appeared to be older and uninhabited.

Plant species observed within the study area were those typical of disturbed land and landscaped/developed land, such as non-native grasses (*Avena* spp., *Bromus* spp., *Cynodon dactylon*, *Hordeum* sp., in part), and weedy forbs (*Amsinckia* sp., *Capsella bursa-pastoris*, *Convolvulus* sp., *Erodium* spp., *Helminthotheca echioides*, *Malva* sp., *Plantago* sp., *Salsola tragus*, in part). There were several ornamental and non-native trees and shrubs associated with adjacent residences present such as eucalyptus, oleander, stone fruit trees, olive trees, citrus trees and adjacent vineyards and orchards. Adjacent to the project area (southeast) was a grove of large mature eucalyptus trees.

The immediate site vicinity is visited frequently by humans (vehicles, residents, farmers). Therefore, wildlife species that are sensitive to human disturbance are less likely to use the project site. Gopher plugs were present within the study area, but no ground squirrels or their burrows were present. No active rodent poisoning was evident. Rodent burrows provide habitat for several secondary inhabitant wildlife species, including snakes, lizards, and burrowing owls.

Busy roadways, landscaped areas, residential areas, and agricultural fields ordinarily provide low to marginal habitat for some terrestrial wildlife, primarily due to the amount of regular ground disturbance, pesticide/herbicide use, heavy foot and vehicle traffic, and feral or domestic animal presence. Wildlife species and sign (tracks and scat) observed on or near the project site during the visit included species from various taxa (Table 1).

Table 1. Wildlife species observed during surveys conducted on March 11, 2018.

SPECIES NAME	COMMON NAME
BIRDS (ALL PROTECTED BY THE MIGRATORY BIRD TREATY ACT*)	
Anas platyrhynchos	Mallard
Ardea alba	Great egret
Branta canadensis	Canada goose
Euphagus cyanocephalus	Brewer's blackbird
Falco sparverius	American kestrel
Haemorhous mexicanus	House finch
Mimus polyglottos	Northern mockingbird
Passer domesticus	House sparrow*
Passerculus sandwichensis	Savannah sparrow
Sayornis nigricans	Black phoebe
Setophaga coronata	Yellow-rumped warbler
Sturnus vulgaris	European starling*
Turdus migratorius	American robin
Zenaida macroura	Mourning dove
MAMMALS	
Canis familiaris	Domestic dog (scat)*
Thomomys sp.	Gopher (mounds/holes)
AMPHIBIANS	

*denotes a non-native species, not protected by MBTA

Wildlife species which may occur or use the project site for foraging or breeding include:

- bird species such as European starlings (*Sturnus vulgaris*), American crow (*Corvus brachyrhyncos*), black phoebe (*Sayornis nigricans*), mourning dove (*Zenaida macroura*), northern mockingbird (*Mimus polyglottos*), killdeer (*Charadrius vociferus*), great blue heron (*Ardea herodias*), great horned owl (*Bubo virginianus*), and various passerine species;
- small mammals such as California ground squirrel (*Spermophilus beecheyi*), desert cottontail (*Sylvilagus audubonii*), fox squirrel (*Sciurus niger*), Botta's pocket gopher (*Thomomys bottae*), broad-handed mole (*Scapanus latimanus*), deer mouse (*Peromyscus maniculatus*), California vole (*Microtus californicus*), old-world rats (*Rattus* sp.), and house mouse (*Mus musculus*).

- various bat species may forage on insects above the adjacent ponding basin, canal and landscaped areas, near street lights, and possibly roost in crevices of houses or in large trees onsite or at neighboring residences;
- medium-sized mammals accustomed to human disturbance which seek rodent prey such as raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), feral and domestic cats (*Felis domesticus*);
- and reptile and amphibian species western fence lizard (*Sceloporus occidentalis*) and Sierran treefrog (*Pseudocris sierra*).

Potential Direct and Indirect Project Impacts

Would the project:

a. *Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U. S. Fish and Wildlife Service?* **(Less than significant with Mitigation incorporation)**

The project site consisted of active agricultural land (row crops), and rural residential development. As such, the project site has been disturbed from its natural state for many years. Although loss of agricultural land may result in decreased foraging area for some species, such land is of limited habitat value for sensitive plant and wildlife species, especially due to the amount of disturbance from humans, vehicles, and domestic animals on a regular basis. The direct impacts of the proposed school will be a loss of marginal habitat and possible direct mortality for any animals in the path of construction equipment. Direct mortality could occur to roosting bats during building demolition (such as pallid bat (*Antrozous pallidus*) and other common species), as well as to common fossorial or slow-moving mammals and reptiles within the project area. Direct mortality could occur to common fossorial or slow-moving mammals and reptiles within the project area. Direct take could also occur for bird eggs and nestlings within the project area if vegetation removal or ground disturbance occur during the nesting season, generally February 1 through August 31. In addition to Migratory Bird Treaty Act (MBTA)-covered bird species, other special status bird species that could occur in the vicinity include Swainson's hawk (*Buteo swainsoni*), white-tailed kite (*Elanus leucurus*), loggerhead shrike (*Lanius ludovicianus*), Lawrence's goldfinch (*Spinus lawrencei*), yellow-billed magpie (*Pica nuttalli*), Nuttall's woodpecker (*Picoides nuttallii*), oak titmouse (*Baeolophus inornatus*), and burrowing owl (*Athene cunicularia*) (Appendix A). The project is not expected to result in direct take of any special status plant species (Appendix B). Indirect impacts to species that may still use the area after construction could include decreased dispersal, increased mortality and injury, and increased debris that through ingestion or physical contact can be harmful to wildlife. All these impacts are caused by the increase in human disturbance (vehicles, people, and pets). However, impacts to special status species can be minimized to a less than significant impact with the incorporation of avoidance and minimization measures.

Special Status Species Impacts and Avoidance Measures

Database queries indicated 50 animals and 15 plant species with special status occur or have historically occurred within the 9-quad search area (Appendices A and B). Many of the species from the generated list either were historic, extirpated occurrences, or were species with very specialized habitat requirements that were not present on the site or within the vicinity. Therefore, the majority of the species were "ruled out". Based on the habitat types present within the study area, 9 special status wildlife species have the potential to occur on the site.

Special Status Bats

The pallid bat (*Antrozous pallidus*) inhabits deserts, grasslands, scrublands, woodlands and open forests. They are most common in open, dry habitats with rocky areas for roosting. Bridges, buildings, and exfoliating tree bark or hollows are frequently used by this species for roost sites (H.T. Harvey 2004). Pallid bats will roost alone or in both large and small groups. Breeding occurs from October to February. Pups are born from late April to July and are volant at 4 to 6 weeks of age. Breeding colonies disperse between August and October. Therefore, within the project area, the older rural residence and associated outbuildings, and the exfoliating bark and hollows of the mature trees are potential suitable roosting habitat. Open water of Mill Ditch and the ponding basin (adjacent to the project area) (Figure 4) provides a water and food source for bats.

Impact

No evidence of bat occupation was observed during reconnaissance surveys. However, access to the residences was not permitted during the survey, so occupation is unknown. Frequent human disturbance and associated noise throughout the project area (traffic, pedestrians, pets, agricultural operation) likely discourages bat roosting. Pallid bats are very sensitive to disturbance of roost sites. Disturbance reduces metabolic economy and can greatly impact species survival (Orr 1954, Zeiner et al. 1990*b*). Nighttime light associated with the project and sound disturbances near roosting areas and maternal colonies may disturb this species and affect bat foraging. The likelihood that pallid bat occupies the project area is very low, as disturbance makes the habitat somewhat marginal. However, direct mortality to bats could occur if a structure is demolished prior to bat eviction. Vibration, noise, and light caused by construction equipment could result in roost abandonment and/or mortality of juvenile bats, if present. However, the incorporation of the following measures would minimize the impacts to less than significant.

Avoidance and Minimization Measures

1. Pre-construction Surveys: Prior to the onset of construction activity, a CDFW-approved biologist will conduct pre-construction surveys for active roosting, breeding, or hibernacula sites (roosts) in large trees and buildings within the project area. Construction/building demolition will not take place as long as a roost site is occupied. Therefore, depending on when construction begins, bat surveys should be timed to be prior to the change in season (maternity vs. hibernation) so that special status bats can be correctly excluded without take (see seasons below). If no active bat roosts, breeding, or hibernacula sites are detected, no further action is required.

2. Avoidance & Minimization:

    a. If any active bat sites are discovered or if evidence of recent occupation is established, the following measures will be implemented in order to minimize impacts on special status bats:

        i. Construction will be scheduled to minimize impacts upon pallid bats. Type and status of active roosts shall be determined, and bat eviction shall be undertaken in a manner that does not exclude bats during times of inclement weather or exclude females from young still in a roost.

        ii. Hibernation sites with evidence of prior occupation will be sealed before the hibernation season (November–March), and nursery sites will be sealed before the nursery season (April–August).

        iii. If the site is occupied by the bats, then construction will occur outside the hibernation season (for hibernacula), and after August 15 (for nursery colonies). Construction/building demolition will not take place as long as the roost site is occupied.

iv. If exclusion devices are used, they will be employed based on current best practices and will be regularly monitored by a qualified biologist.

b. All new lighting shall be down-cast to reduce disturbance impacts to bat species.

Special Status Birds

Eight special status avian species (Swainson's hawk, white-tailed kite, loggerhead shrike, Lawrence's goldfinch, yellow-billed magpie, Nuttall's woodpecker, oak titmouse, and burrowing owl) have the potential to nest and/or forage within the study area. Greater detail regarding life history requirements of these birds is provided in Appendix A. Swainson's hawk, white-tailed kite, Lawrence's goldfinch, yellow-billed magpie, Nuttall's woodpecker, and oak titmouse could nest in the large trees within and adjacent to the study area. Loggerhead shrike could nest in shrubs or trees within and adjacent to the study area and forage in the open fields. Although none were detected during reconnaissance survey, burrowing owls could move into the area prior to construction, and occupy any large burrows during the nesting and wintering seasons.

Impact

Since CDFW usually requires a various sized "no disturbance" buffers around nesting sites for these species, construction-related disturbance could be considered take under CESA and MBTA. Specific impacts to burrowing owl according to the *Staff Report on Burrowing Owl Mitigation* (CDFG 1995) include any "disturbance within 50 meters (approx. 160 ft) [75 m (250 ft) during breeding season] which may result in harassment of owls at occupied burrows; destruction of natural and artificial burrows (culverts, concrete slabs and debris piles that provide shelter to burrowing owls); and destruction and/or degradation of foraging habitat adjacent (within 100 m) of an occupied burrow(s)".

In addition, other migratory birds will likely be nesting in the study area and vicinity, most of which are protected by the Migratory Bird Treaty Act (USCA 1918). Both construction related disturbance and the removal of vegetation within the project area could result in nest abandonment or direct mortality of eggs, chicks, and/or fledglings. This type of impact to migratory birds, including special status bird species, would be considered take under the MBTA and CESA, and therefore, is a potentially significant impact. In order to avoid impacts to avian species, nests and nesting habitat should not be disturbed or destroyed. The following measures will reduce potential impacts to a less than significant level.

Avoidance and Minimization Measures

1. <u>Avoidance</u>. If feasible, any vegetation removal will take place between September 1 and February 1 to avoid impacts to nesting birds in compliance with the Migratory Bird Treaty Act. If vegetation removal must occur during the nesting season, project construction may be delayed due to actively nesting birds and their required protective buffers.

2. <u>Pre-construction Surveys.</u>

   a. If vegetation removal or ground disturbance will commence between February 1 and August 31, a qualified biologist will conduct a pre-construction survey for nesting birds within 14 days of the initiation of disturbance activities. This survey will cover:

      i. Potential nest sites in trees, bushes, or grass within species-specific buffers of the project area (Swainson's hawk – 0.5-mile, other raptor species such as white-tailed kite – 500 ft, non-raptor species (loggerhead shrike, magpie etc. – 250 ft).

      ii. Survey protocol developed by the Swainson's Hawk Technical Advisory Committee (TAC) should be followed (CDFG 2000), which includes survey timing and requirements for repeated visits.

b. Surveys for burrowing owl will occur within 14 days prior to any ground disturbance, no matter the season. This survey will cover potential burrowing owl burrows in the project area and suitable habitat within 150 m (500 ft). Evaluation of use by owls shall be in accordance with California Department of Fish and Wildlife survey guidelines (CBOC 1993, CDFG 1995, CDFG 2012). Surveys will document if burrowing owls are nesting or using habitat in or directly adjacent to the project area. Survey results will be valid only for the season (breeding (Feb 1-Aug 31) or non-breeding (Sept 1-Jan 31) during which the survey is conducted.

c. If no active nests or burrows are detected during the pre-construction survey, then no further action is required. If an active nest or burrow is detected, then the following minimization measures will be implemented.

3. <u>Minimization/Establish Buffers.</u>

   a. Swainson's hawk, white-tailed kite, loggerhead shrike, Lawrence's goldfinch, yellow-billed magpie, Nuttall's woodpecker, oak titmouse, and MBTA-protected species: If any active nests are discovered (and if construction will occur during bird breeding season), the USFWS and/or CDFW will be contacted to determine protective measures required to avoid take. These measures could include fencing off an area where a nest occurs, or shifting construction work temporally or spatially away from the nesting birds. Biologists are required on site to monitor construction while protected migratory birds are nesting in the project area. If an active nest is found after the completion of the pre-construction surveys and after construction begins, all construction activities will stop until a qualified biologist has evaluated the nest and erected the appropriate buffer around the nest.

   b. Burrowing owl:

      If burrowing owls are detected within the survey area, CDFW should be consulted to determine the suitable buffer. These buffers will consider the level of disturbance of the project activity, existing disturbance of the site (vehicle traffic, humans, pets, etc.), and time of year (nesting vs. wintering). If avoidance is not feasible, the City will work with CDFW to determine appropriate mitigation, such as passive exclusion or translocation, and associated mitigation land offset (CDFG 2012).

4. <u>If avoidance is not feasible,</u> a qualified biologist will develop appropriate mitigations that will reduce project impacts to sensitive biological resources to a less than significant level. The type and amount of mitigation will depend on the resources impacted, the extent of the impacts, and the quality of habitats to be impacted. Mitigations may include but are not limited to: 1) Compensation for lost habitat in the form of preservation or creation of in-kind habitat protected by conservation easement; 2) Purchase of appropriate credits from an approved mitigation bank or land trust servicing the Fresno County Area; 3) Payment of in-lieu fees.

Special Status Plants

Impact

Of the 15 potentially occurring special status plant species, none were found within the project area. Although the site survey was not conducted at the peak blooming period for some potentially occurring special status plants, all plants could be ruled out because their elevation range, required habitat, and/or soil type differed from the site conditions. Therefore, the project will not impact any special status plant species.

b. *Have a substantially adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Game or U. S. Wildlife Service?* **(No impact)**

There are no riparian or sensitive natural communities within the project area.

c. *Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?* **(No impact)**

There are no federally protected wetlands within the project area. Implementation of typical ground disturbance and erosion control Best Management Practices (BMPs) and compliance with grading permits will insure that there is no impact to storm drainage facilities or nearby canals.

d. *Interfere substantially with the movement of any resident or migratory fish or wildlife species or with established native resident migratory wildlife corridors, or impede the use of native wildlife nursery sites?* **(Less than Significant)**

The site does not appear to constitute a "movement corridor" for native wildlife (USFWS 1998) that would attract wildlife to move through the site any more than the surrounding developed and agricultural lands. The project site is bordered by busy streets as well as industrial and agricultural development, which restricts access for wildlife. Smaller wildlife species and birds are not expected to be further inhibited by the project as compared with residential and agricultural uses. Therefore, the project will have a less than significant effect on regional wildlife movements (MO).

e. *Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?* **(No Impact)**

The project appears to be consistent with relevant biological resources policies of the City of Fresno and would not conflict with local policies or ordinances protecting biological resources (City of Fresno 2014).

f. *Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional or state habitat conservation plan?* **(No Impact)**

Fresno County is not part of any HCP or NCCP, so the project would not conflict any provisions of any local, regional or state habitat conservation plan (MO, USFWS 1998, 2005).

Cumulative Impact

The small loss of agricultural land and rural residential development will not substantially contribute to the cumulative loss of habitat or the decline of special-status species. Therefore, implementation of the proposed project would not result in significant cumulative impacts to biological resources.

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Site Photos – March 11, 2018

Project area along Fowler Avenue. Existing farm stand and access road. Rural residence and associated mature trees in background. Looking north.

Typical habitat in the project area (row crops). Rural residential and mature trees (potential bird nesting habitat) in background. Looking east from western edge of project area.

Project area looking northeast towards older residence and agricultural support buildings (potential bat roosting habitat).

Older, assumed abandoned, rural residence (potential bat roosting habitat). Looking northeast from project area.

Rural residence and associated trees (nesting bird habitat) on northwest corner of project area. Fowler Avenue to right; fence for equipment yard to left. Photo taken from adjacent property, looking south.

Mill Ditch and ponding basin (to right) on adjacent land to south of project area. Looking east.

Appendices and Maps

Appendix A. Special status animal species known from the vicinity of the Fowler-McKinley Elementary School Project.

Name	Status* State	Status* Federal	Description of Habitat Required [c, e, f]	Historic 9 Quad Presence[a]	Potential to Occur in Study Area [a,b,d]
MAMMALS					
Pallid bat (*Antrozous pallidus*)	SSC	FSC	Deserts, grasslands, scrublands, woodlands and open forests. Most common in open, dry habitats with rocky areas for roosting. Bridges, buildings, and exfoliating tree bark or hollows are frequently used for roost sites (H.T. Harvey 2004).	Fresno South	Possible. Project Area residences and associated large trees may provide roosting habitat. Species could forage over project area and adjacent ponding basin or canal.
Fresno kangaroo rat (*Dipodomys nitratoides exilis*)	SE	FE	Alkali sink plant community to bare alkaline soils. Chenopod scrub and alkali grasslands in western Fresno County. Inhabits seasonally inundated bare alkaline soils. Associated with friable soil mounds.	Fresno North	None. No habitat present.
Spotted bat (*Euderma maculatum*)	SSC	None	Occupies arid deserts, grasslands and mixed conifer forests. Feeds over water and along washes. May move from forests to lowlands in autumn. Roost in crevices and cliffs primarily, often solitary. Rarely found in buildings or caves, and they are not known to use bridges or trees for roosts (H.T. Harvey 2004).	Friant	Unlikely. There are no cliff faces or rock areas in the project vicinity; therefore, suitable roosting habitat is not present. Species could forage over project area and adjacent ponding basin or canal. However, Project Area residences provide extremely marginal roosting habitat and therefore this species is unlikely to occur.
Western mastiff bat (*Eumops perotis californicus*)	SSC	None	Many open, semi-arid to arid habitats, including annual and perennial grasslands, among others. Usually present only where there are significant rock features offering suitable roosting habitat. Frequently roosts in crevices in cliff faces and rocks; high buildings are used rarely, and they are not known to use bridges or trees for roosts (H.T. Harvey 2004).	Fresno North, Fresno South	Unlikely. There are no cliff faces or rock areas in the project vicinity; therefore, suitable roosting habitat is not present. Species could forage over project area and adjacent ponding basin or canal. However, no suitable roosting habitat is within the project area.
American badger (*Taxidea taxus*)	SSC	None	Herbaceous, shrub, and open stages of most habitats with dry, friable soils.	Lanes Bridge, Clovis	Unlikely. Potential habitat present is frequently disturbed by plows (which destroy potential burrow sites), people and domestic animals. Also, access is restricted due to frequently travelled streets and development.

	Status*				
Name	**State**	**Federal**	**Description of Habitat Required** [c, e, f]	**Historic 9 Quad Presence**[a]	**Potential to Occur in Study Area** [a,b,d]
San Joaquin kit fox (*Vulpes macrotis mutica*)	ST	FE	Large tracts of open, level, sandy ground preferred. Often associated with annual grasslands and small mammal burrow complexes.	Friant, Sanger	Unlikely. Potential habitat present is frequently disturbed by plows (which destroy potential burrow sites and prey base), people and domestic animals. Also, access is restricted due to frequently travelled streets, fences, and residential development. Nearest location is 7 miles away and was last detected in the 1980s. According to the City of Clovis EIR, the species appears to be absent from the City of Clovis Plan Area (City of Clovis 2014).
BIRDS					
Tricolored blackbird (*Agelaius tricolor*)	SSC SCE	FSC	Open grasslands and pasturelands associated with nesting cover (e.g., blackberry shrubs, wetland emergent vegetation, etc.). Breeds Mar 15 to Aug 10.	Fresno North, Round Mountain, Academy	Unlikely. Possible foraging habitat in open fields. Suitable aquatic nesting habitat is absent.
Clark's grebe (*Aechmophorus clarkii*)	None	FSC	Breed on freshwater lakes and marshes with extensive open water bordered by emergent vegetation. During winter they move to saltwater or brackish bays, estuaries, or sheltered sea coasts and are less frequently found on freshwater lakes or rivers.	None	None, no habitat present.
Burrowing owl (*Athene cunicularia*)	SSC	FSC	Ground dweller of open country, golf courses, airports, etc. Often associated with California ground squirrel burrow complexes.	Round Mountain, Clovis, Lanes Bridge	Possible. Suitable breeding and foraging habitat present. Although no suitably sized small mammal burrows were observed in the study area, they could easily be built between the time of survey and the time of school construction.
Golden eagle (*Aquila chrysaetos*)	None	BGEPA	Inhabits mountainous or hilly terrain, hunting over open country. Also found in valleys and western plains, especially in migration and winter. Nests on cliffs or in trees. Breeds Jan 1 to Aug 31	None	Unlikely. Project area and developed vicinity are not suitable nesting habitat. Very unlikely foraging habitat due to developed nature and human presence.
Oak titmouse (*Baeolophus inornatus*)	None	FSC	Usually found in warm, open, dry oak or oak-pine woodlands. Will also use scrub oaks or other brush as long as woodlands are nearby. They live in a restricted range, from southwest	Not followed in CNDDB	Possible. Project area and adjacent trees are suitable habitat for this species year-round.

Name	Status* State	Federal	Description of Habitat Required[c, e, f]	Historic 9 Quad Presence[a]	Potential to Occur in Study Area[a,b,d]
			Oregon to northwest Baja California, with another population in the Cape District of south Baja California. Breeds Mar 15 to Jul 15.		
Swainson's hawk (*Buteo swainsoni*)	ST	FSC	Open agricultural fields, grasslands, and low hills, with sparse trees. Nesting often associated with riparian areas.	Malaga, Fresno North, Fresno South, Clovis, Lanes Bridge	Possible. Foraging habitat in open fields and nesting habitat in adjacent large trees.
Costa's Hummingbird (*Calypte costae*)	None	FSC	Desert riparian, desert and arid scrub foothill habitats. Breeds Jan 15 to Jun 10.	Not followed in CNDDB	Unlikely. No desert habitat present, but crops may provide suitable foraging habitat.
Lawrence's goldfinch (*Carduelis lawrencei*)	None	FSC	Open woodlands, chaparral, and weedy fields. Nests mid-height in trees with a cup nest made of leaves, grass stems and lichen. Breeds Mar 20 to Sep 20.	Not followed in CNDDB	Possible. Foraging habitat in open fields and nesting habitat in adjacent large trees.
Wrentit (*Chamaea fasciata*)	None	FSC	Year-round resident in coastal scrub, chaparral, oak woodland, evergreen forests, and dense shrublands with coyotebush, manzanita, California lilac, and blackberry thickets in foothills, coastal, and desert regions of California and Oregon. Tend to avoid areas with non-native plants such as eucalyptus and broom. Breeds Mar 15 to Aug 10, in shrubs and trees; creates a cup nest 1 – 9 feet high.	Not followed in CNDDB	Unlikely. No chaparral/shrub habitat present.
Mountain Plover (*Charadrius montanus*)	SSC	FSC	Short grasslands, freshly plowed fields, sprouting grain fields, and sod farms. Seen in areas of short vegetation or bare ground in flat topography, often where grazing and mammal burrows are present. This species does not breed in California.	None	Unlikely. Winter foraging habitat adjacent in the open fields. Species only known from west side of San Joaquin Valley. Outside of current known range.

Name	Status* State	Federal	Description of Habitat Required [c, e, f]	Historic 9 Quad Presence[a]	Potential to Occur in Study Area [a,b,d]
Northern harrier (*Circus cyaneus*)	SSC	None	Grasslands, open agricultural fields, and edges of wetlands. Typically nests on the ground among dense cover.	None	Unlikely. Nesting habitat is marginal due to frequent ground disturbance. Could forage over vacant lots/fields in project vicinity.
Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)	SE	FT	Occupies open woodlands and with shrubby vegetation. Nests in willow and cottonwood riparian forests with dense understory of shrubs and vines.	Lanes Bridge, Clovis, Malaga, Round Mountain, Sanger	None. No riparian habitat present.
Black swift (Cypseloides niger)	SSC	FSC	Open sky over mountains, coastal cliffs. Forages widely over any kind of terrain but is still very local in its occurrence, probably limited to regions with suitable nesting sites. Nests on ledges or in crevices in steep cliffs, either along coast or near streams or waterfalls in mountains. Breeds Jun 15 to Sep 10	None	None. No suitable nesting habitat in the vicinity.
White-tailed kite (nesting) (*Elanus leucurus*)	FP	None	Fairly common in grasslands, open agricultural fields and fallow highway median strips. Substantial groves of dense, broad-leafed deciduous trees used for nesting and roosting.	None	Possible. Could forage over vacant lots and open fields. Could nest in trees adjacent to the project area.
Bald eagle (*Haliaeetus leucocephalus*)	SE; FP	BGEPA; delisted	Inhabits lower montane coniferous forests and areas with oldgrowth trees. Prefers ocean shore, lake margins, & rivers for both nesting & wintering. Most nests are found within 1 mi of water. Nests in large, old-growth, or dominant live tree w/open branches, especially ponderosa pine. Roosts communally in winter. Breeds Jan 1 to Aug 31.	None	Unlikely. Could forage in the open fields, however, habitat type, frequent human disturbance and urban surrounding make nesting highly unlikely. Known to nest near Shaver Lake in Fresno County.
Loggerhead shrike (*Lanius ludovicianus*)	SSC	FSC	Hunts in open or brushy areas, diving from low perch. Nests in dense shrubs or trees associated with foraging areas.	None	Possible. Could nest in trees and shrubs within the study area and forage over open areas.
Marbled godwit (*Limosa fedoa*) (wintering)	None	FSC	Occurs from mid-August to early May in estuarine habitats along coastal CA, and in the Grasslands Ecological Area in Merced County	Not followed in CNDDB	Unlikely. Not within known range, and no wetland habitat present. Could forage in fallow fields during migration.

Name	Status* State	Federal	Description of Habitat Required [c, e, f]	Historic 9 Quad Presence[a]	Potential to Occur in Study Area [a,b,d]
			year-round. Foraging and roosting habitat include estuarine mudflats, sandy beaches, open shores, saline emergent wetlands, and adjacent wet upland fields. Nests in Canadian and extreme northern US, prairies.		
Short-billed dowitcher (*Limnodromus griseus*)	None	FSC	Mudflats, tidal marshes, pond edges. Migrants and wintering birds favor coastal habitats, especially tidal flats on protected estuaries and bays, also lagoons, salt marshes, sometimes sandy beaches. Migrants also stop inland on freshwater ponds with muddy margins. Breeds in far north, mostly in open bogs, marshes, and edges of lakes within coniferous forest zone. Breeds elsewhere.	Not followed in CNDDB	Unlikely. Winter foraging/migration habitat is marginal due to frequent disturbance. No nesting habitat present – out of range.
Lewis' woodpecker (*Melanerpes lewis*) (wintering)	None	FSC	Breeds in open forest and woodland with an open canopy and brushy understory. Requires dead trees for nest cavities. Winters and migrates through Sierra Nevada foothills and central valley. Breeds Apr 20 to Sep 30.	Not followed in CNDDB	Unlikely. Winter foraging/migration habitat is marginal due to frequent disturbance. No nesting habitat present.
Long-billed curlew (*Numenius americanus)* (wintering)	None	FSC	Breeds in sparse, short grasses, including shortgrass and mixed-grass prairies as well as agricultural fields of western North America. In winter they migrate to the coasts and to interior Mexico, and use wetlands, tidal estuaries, mudflats, flooded fields, and occasionally beaches. Breeds elsewhere.	Not followed in CNDDB	Unlikely. No wetland habitat present. Could forage in fallow fields during migration.
Whimbrel (*Numenius phaeopus*)	None	FSC	Shores, mudflats, marshes, tundra. Found on a wide variety of habitats on migration. Most common on mudflats, but also found on rocky shores, sandy beaches, salt marshes, flooded agricultural fields, grassy fields near coast. In summer, breeds on Arctic tundra.	Not followed in CNDDB	Unlikely. No wetland habitat present. Could forage in fallow fields during migration.
Double-crested cormorant (*Phalacrocorax auritus*)	WL	None	Colonial nester on coastal cliffs, offshore islands, and along lake margins in the interior of the state, within riparian type habitats. Nests	Clovis	None. No habitat present.

Name	Status* State	Status* Federal	Description of Habitat Required [c, e, f]	Historic 9 Quad Presence[a]	Potential to Occur in Study Area [a,b,d]
			along coast on sequestered islets, usually on ground with sloping surface, or in tall trees along lake margins.		
Yellow-bill magpie (*Pica nuttalli*)	None	FSC	California endemic species that occurs in the Central Valley and coastal mountain ranges from south of San Francisco to Santa Barbara County. Requires open oak & riparian woodland, farm & ranchland or urban areas with tall trees near grassland, pasture or cropland. Breeds Apr 1 to Jul 31.	Not followed in CNDDB	Possible. Could nest in trees within the study area and forage in open fields, agricultural land, or landscaped areas.
White headed woodpecker (*Picoides albolarvatus*)	None	FSC	Occurs in lower and upper montane coniferous forest. Nests in open montane conifer forests with large trees and snags and tree/shrub and tree/herbaceous ecotones. Prefers semi-open areas. Excavates cavity in large snag or stump at least 2 ft in diameter at nest height. Breeds May 1 to Aug 15.	Not followed in CNDDB	None. No habitat present.
Nuttall's woodpecker (*Picoides nuttallii*)	None	FSC	Oak forest and woodlands, including riparian zones. Requires standing snag or hollow tree for nest cavity. Breeds Apr 1 to Jul 20.	Not followed in CNDDB	Possible. Project area and adjacent trees are suitable habitat for this species year-round.
Rufous hummingbird (*Selasphorus rufus*)	None	FSC	Forest edges, streamsides, mountain meadows. Breeding habitat includes forest edges and clearings, and brushy second growth within the region of northern coast and mountains. Winters mostly in pine-oak woods in Mexico. Migrants occur at all elevations but more commonly in lowlands during spring, in mountain meadows during late summer and fall. Breeds elsewhere.	Not followed in CNDDB	Unlikely. May use residential landscaped areas adjacent and forage during spring migration. Otherwise, outside of known breeding range.
Black-chinned Sparrow (*Spizella atrogularis*)	None	FSC	Brushy mountain slopes, open chaparral, sagebrush. Found mostly in arid scrub on hillsides, from low foothills up to almost 7,000' in mountains, in chaparral and open thickets of manzanita, scrub oak, sagebrush, chamise, and other low shrubs. In winter also found locally	Not followed in CNDDB	None. No suitable habitat present.

Name	Status* State	Status* Federal	Description of Habitat Required [c, e, f]	Historic 9 Quad Presence[a]	Potential to Occur in Study Area [a,b,d]
			in desert areas, mesquite thickets. Breeds Apr 15 to Jul 31.		
California thrasher (*Toxostoma redivivum*)	None	FSC	Chaparral, foothills, valley thickets, parks, gardens. Within its range, found in practically any lowland habitat with dense low brush. Most common in chaparral, also occurs in streamside thickets and in suburban neighborhoods that have enough vegetation. Extends into edges of desert regions, and in chaparral in mountains up to about 6,000'. Breeds Jan 1 to Jul 31	Not followed in CNDDB	Unlikely. Residential landscaping adjacent to the project area may provide marginal habitat, but very unlikely to occur in the area.
Willet (*Tringa semipalmata*)	None	FSC	Marshes, wet meadows, mudflats, beaches. Nests inland, around fresh marshes in open country, especially native grassland. In migration and winter, both forms occur on mudflats, tidal estuaries, sandy beaches. Breeds elsewhere.	Not followed in CNDDB	Unlikely. No wetland habitat present. Could forage in fallow fields during migration.
Least Bell's vireo (*Vireo bellii pusillus*)	SE	FE	Occurs in riparian forest, scrub, and woodlands. Summer resident of Southern California in low riparian in vicinity of water or in dry river bottoms; below 2000 ft. Nests placed along margins of bushes or on twigs projecting into pathways, usually willow, *Baccharis* sp., and mesquite.	Clovis	None. No riparian habitat present.
REPTILES					
Northern California legless lizard (*Anniella pulchra*)	SSC	None	Sandy or loose loamy soils under sparse vegetation in chaparral, coastal dunes or coastal scrub. Soil moisture is essential. They prefer soils with a high moisture content.	Malaga, Fresno North, Fresno South, Clovis	Unlikely. Only known from a historic collection in general Fresno area. Last seen in 1880s. Suitable habitat not present.

Name	Status* State	Federal	Description of Habitat Required [c, e, f]	Historic 9 Quad Presence[a]	Potential to Occur in Study Area [a,b,d]
California glossy snake (*Arizona elegans occidentalis*)	SSC	None	Patchily distributed from the eastern portion of San Francisco Bay, southern San Joaquin Valley, and the Coast, Transverse, and Peninsular ranges, south to Baja California. Generalist reported from a range of scrub and grassland habitats, often with loose or sandy soils.	Malaga, Fresno North, Fresno South, Clovis	Unlikely. Exact location of the CNDDB occurrence is unknown and therefore mapped to the center of Fresno. The collection was one male recorded in 1893. Known current range is only in western Fresno County in grassland hills. Any potential habitat present is frequently disturbed by plows (which destroy potential burrow sites and prey base), people and domestic animals.
Blunt-nosed leopard lizard (*Gambelia (=Crotaphytus) sila)*	SE, FP	FE	Occurs in semi-arid grasslands, washes and alkali flats, with sandy/gravelly/loamy soils. Occurs with plants such as annual and bunch grasses and *Atriplex* sp. Small mammal burrows provide cover for this species.	None	None. No habitat present.
Western pond turtle (*Emys marmorata* aka *Actinemys marmorata*)	SSC	None	Aquatic turtle of ponds, lakes, marshes, rivers, streams, and irrigation ditches that typically have rocky or muddy bottom, with aquatic vegetation. Nests in uplands associated with wetland habitat.	Clovis, Academy, Friant	None. No habitat present.
Giant garter snake (*Thamnophis gigas*)	ST	FT	Marshes, sloughs, mud-bottom canals of rice farming areas, but occasionally slow streams. Bulrush and cattails typically present. Extremely aquatic. Found in areas with aquatic connectivity to San Joaquin River and Delta.	None	None. No habitat present.
Coast horned lizard (*Phrynosoma blainvillii*)	SSC	None	Frequents a wide variety of habitats, most common in lowlands along sandy washes with scattered low bushes. Requires open areas for sunning, bushes for cover, patches of loose soil for burial, and abundant supply of ants and other insects.	Malaga, Fresno North, Fresno South, Clovis	Unlikely. Project area is extremely marginal habitat due to frequent disturbance from farming and lack of preferred habitat elements. This occurrence in CNDDB is listed as possibly extirpated and collection localities are very general, given only as “Fresno” from 1893.
AMPHIBIANS					
California tiger salamander (*Ambystoma californiense*)	ST, SSC	FT	Quiet water of ponds, reservoirs, lakes, vernal pools, streams, and stock ponds within annual grasslands, oak savannah, oak woodland and open chaparral.	Friant, Round Mountain, Lanes Bridge,	None. No habitat present in the project area due to frequent human disturbance and agricultural operation.

Name	Status* State	Federal	Description of Habitat Required [c, e, f]	Historic 9 Quad Presence[a]	Potential to Occur in Study Area [a,b,d]
				Academy, Malaga, Fresno North, Fresno South, Clovis	
California red-legged frog (*Rana draytonii*)	SSC	FT	Chiefly lakes, ponds, and streams in coastal forest, inland woodlands, and valley grasslands where cattails, bulrush, or other plants provide dense cover. Aquatic sites need not be permanent.	None	None. No habitat present in the project area due to frequent human disturbance and agricultural operation.
Western spadefoot (*Spea hammondii*)	SSC	None	Primarily a species of the lowlands, frequenting washes, river floodplains, alluvial fans, playas, alkali flats, but also foothills and mountains. Open vegetation and short grasses preferred, with sandy or gravelly soil. Valley and foothill grasslands, open chaparral, pine-oak woodlands. Often associated with vernal pools.	Friant, Fresno North, Lanes Bridge, Round Mountain	None. No habitat present in the project area due to frequent human disturbance and agricultural operation.
FISH					
Delta smelt (*Hypomesus tranpacificus*)	SE	FT	Found only from the Suisun Bay upstream through the Delta in Contra Costa, Sacramento, San Joaquin, Solano and Yolo counties. Typically found in estuarine waters-along the freshwater edge of the mixing zone (saltwater-freshwater interface), and upstream into river channels and tidally-influenced backwater sloughs. Most spawning happens in tidally-influenced backwater sloughs and channel edgewaters.	None	None. No habitat present.
Hardhead (*Mylopharodon conocephalus*)	SSC	None	Clear, deep pools with sand-gravel-boulder bottoms & slow water velocity. Not found where exotic centrarchids predominate.	Lanes Bridge	None. No habitat present.
INVERTEBRATES					

Name	Status* State	Federal	Description of Habitat Required [c, e, f]	Historic 9 Quad Presence[a]	Potential to Occur in Study Area [a,b,d]
Conservancy fairy shrimp (*Branchinecta conservatio*)	None	FE	Rather large, cool-water vernal pools with moderately turbid water; the pools generally last until June.	None	None. Outside of known current range of species. No large vernal pools present.
Vernal pool fairy shrimp (*Branchinecta lynchi*)	None	FT	Vernal pool habitats from small, clear, sandstone rock pools to large, turbid, alkaline, grassland valley floor pools. Tends to occur in smaller pools, most frequently pools measuring less than 0.05 acre often associated with mud bottomed swales, or basalt flow depression pools in unplowed grasslands.	Friant, Lanes Bridge, Clovis Round Mountain, Academy	None. No habitat present in the project area due to frequent human disturbance and agricultural operation.
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	None	FT	Nearly always found on or close to its host plant, elderberry (*Sambucus* sp.). Inhabited shrubs typically have stems that are 1.0 inch or greater in diameter at ground level. Distribution is patchy throughout the remaining riparian forests of the Central Valley from Redding to Madera County.	Lanes Bridge, Sanger	None. Outside of updated species range. No habitat present or elderberry shrubs present.

* None = no special status granted or recognized by named party
BGEPA = Bald and Golden Eagle Protection Act; USFWS prohibits the taking, possession and commerce of such birds.
FC = Federal Candidate; USFWS/NOAA FISHERIES has enough information on biological vulnerability and threats to support a proposal to list as endangered or threatened.
FE = Federally Endangered; listed by USFWS as in danger of extinction throughout all or a significant portion of its range.
FT = Federally Threatened; listed by USFWS as likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
FSC = Federal Species of Concern, including Birds of Conservation Concern; provides no protection, but allows for awareness and research efforts that may keep species from being listed.
SCE = California Candidate for Endangered Status under the CESA.
SCT = California Candidate for Threatened Status under the CESA.
SE = California Endangered under the CESA.
ST = California Threatened under the CESA.
FP = Fully Protected under California Fish and Game Code (Sections 3511, 4700, 5050, and 5515)
SSC = California Species of Special Concern.
a = Based upon quad lists from query of California Natural Diversity Database (CNDDB) search, accessed March 2018.
b = Based upon planning survey conducted by Odell P&R on project site during March 2018.
c = USFWS Sacramento Fish and Wildlife Office's Endangered Species Program; http://www.fws.gov/sacramento/es/
d= Moyle, P.B. 2002. Inland fishes of California. University of California Press. Berkeley, CA
e= Zeiner, D.C., W.F.Laudenslayer, Jr., K.E. Mayer, and M. White, eds. 1988-1990. California's Wildlife. Vol. I-III. California Department of Fish and Game, Sacramento, California.
f = Shuford, W. D., and Gardali, T., editors. 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.

Appendix B. Special status plant species known from the vicinity of the Fowler-McKinley Elementary School Project.

Name	Status[a]		Description of Habitat Required[b]	Blooming Period	Historic 9 Quad Presence[c]	Potential to Occur in Study Area[d]
	State	Federal				
Hoover's calycadenia (*Calycadenia hooveri*)	1B.3	None	Occurs on exposed, rocky, barren soil in Cismontane woodland, valley and foothill grassland, between 60-260 meters elevation.	July-Sep	Lanes Bridge	Not Present. No habitat present. Site highly disturbed.
Succulent owl's-clover (*Castilleja campestris* ssp. *succulenta*)	SE, 1B.2	FT	Occurs in vernal pools and valley and foothill grassland, often in acidic soils, between 50-750 meters of elevation.	Apr-May	Lanes Bridge, Round Mountain, Friant, Fresno North*	Not Expected. Site disturbed, and no vernal pool habitat on site, and no vernal pool habitat on site.
California jewel-flower (*Caulanthus californicus*)	SE, 1B.1	FE	Occurs in chenopod scrub, pinyon and juniper woodland, valley and foothill grassland often with sandy soil. 61-1000 meters elevation.	Feb-May	Fresno North*, Fresno South*, Clovis*, Malaga*	Not Expected. No grassland habitat present. Site highly disturbed. Thought to be extirpated from Fresno area. (Closest CNDDB occurrence does not have date- no habitat left within vicinity of Fresno- Extirpated from Fresno Area).
Dwarf downingia (*Downingia pusilla*)	2B.2	None	Valley and foothill grassland (mesic sites), vernal pools. Vernal lake and pool margins with a variety of associates. In several types of vernal pools. 1-445 m.	Mar-May	Friant	Not Expected. No vernal pool or grassland habitat present.
Spiny-sepaled button-celery (*Eryngium spinosepalum*)	1B.2	None	Vernal pools, valley and foothill grassland. Some sites on clay soil of granitic origin; vernal pools, within grassland. 100-420 meters.	Apr-May	Round Mountain*, Friant, Lanes Bridge	Not Expected. No vernal pool or grassland habitat present.
California satintail (*Imperata brevifolia*)	2B.1	None	Occurs on mesic sites, alkali seeps, and riparian areas in chaparral, coastal scrub, Mojavean desert scrub, and meadows and seeps between 0-500 meters in elevation.	Sep-May	Malaga, Fresno North, Fresno South, Clovis	Not Present. No habitat present. Site highly disturbed.
Forked hare-leaf (*Lagophylla dichotoma*)	1B.1	None	Occurs in cismontane woodland, and valley and foothill grassland, sometimes in clay soils, between 45-335 meters in elevation.	Apr-May	Round Mountain	Not Expected. No grassland or woodland habitat present. Site highly disturbed.
Madera leptosiphon (*Leptosiphon serrulatus*)	1B.2	None	Often occurs on dry slopes and decomposed granite in cismontane woodland and lower montane coniferous forest between 300-1300 meters of elevation.	Apr-May	Friant, Malaga, Fresno North, Fresno South, Clovis	Not Present. No habitat present. Site highly disturbed.

Name	Status[a]		Description of Habitat Required[b]	Blooming Period	Historic 9 Quad Presence[c]	Potential to Occur in Study Area[d]
	State	Federal				
San Joaquin Valley Orcutt grass (*Orcuttia inaequalis*)	SE, 1B.1	FT	Occurs in vernal pools, between 10-755 meters in elevation.	Apr-Sep	Lanes Bridge, Friant, Fresno North*	Not Present. No vernal pool habitat present.
Hairy Orcutt grass (*Orcuttia pilosa*)	SE, 1B.1	FE	Occurs in vernal pools, between 45-200 meters in elevation.	May-Sep	Lanes Bridge	Not Present. No vernal pool habitat present.
Hartweg's golden sunburst (*Pseudobahia bahiifolia*)	SE, 1B.1	FE	Valley and foothill grassland, cismontane woodland. Clay soils, often acidic. Predominantly on the northern slopes of knolls, but also along shady creeks or near vernal pools. 15-150 m.	Mar - Apr	Friant	Not present. None observed. No suitable habitat.
San Joaquin adobe sunburst (*Pseudobahia peirsonii*)	SE, 1B.1	FT	Valley and foothill grassland, cismontane woodland. Grassy valley floors and rolling foothills in heavy clay soil. 90-800 m.	Mar-Apr	Round Mountain	Not Expected. Habitat extremely marginal and highly disturbed. None observed during any of the site visits.
Sanford's arrowhead (*Sagittaria sanfordii*)	1B.2	None	Occurs in standing or slow-moving freshwater ponds, marshes, swamps, ditches between 0-650 meters in elevation.	May-Oct	Friant, Clovis, Fresno North	Not Present. Suitable habitat not present.
Caper-fruited tropidocarpum (*Tropidocarpum capparideum*)	1B.1	None	Occurs in valley and foothill grassland, often alkaline hills, between 1-455 meters of elevation.	Mar-Apr	Malaga, Fresno South, Fresno North, Clovis	Not Expected. No grassland habitat or alkaline soils present. The only source of information for the one nearby CNDDB occurrence is from a 1930 collection. This plant is presumed extant in the area, but exact location of collection unknown (assumed centered on City of Fresno). Also, no plants have been documented in the vicinity since 1930.
Greene's tuctoria (*Tuctoria greenei*)	Rare, 1B.1	FE	Occurs in dry bottoms of vernal pools in valley and foothill grasslands between 30-1070 meters in elevation.	May-Jul	Round Mountain*, Sanger*, Clovis*	Not Expected. No vernal pool habitat present. All known occurrences have been extirpated.

a Status codes are as follows:
FC = Federal Candidate; USFWS/NOAA FISHERIES has enough information on biological vulnerability and threats to support a proposal to list as endangered or threatened.
FE = Federally Endangered; listed by USFWS as in danger of extinction throughout all or a significant portion of its range.
FT = Federally Threatened; listed by USFWS as likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
FSC = Federal Species of Concern; provides no protection, but allows for awareness and research efforts that may keep species from being listed.

SCE = California Candidate for Endangered Status under the CESA.
SCT = California Candidate for Threatened Status under the CESA.
ST = California Threatened under the CESA.
FP = Fully Protected under California Fish and Game Code (Sections 3511, 4700, 5050, and 5515)
SSC = California Species of Special Concern.
Rare = State listed as Rare

California Rare Plant Rank:

1A	Presumed extinct in California
1B	Rare or Endangered in California and elsewhere
2	Rare or Endangered in California, more common elsewhere
3	Plants for which we need more information - Review list
4	Plants of limited distribution - Watch list

California Native Plant Society Threat Codes:

.1	Seriously Endangered in California (over 80% of occurrences Threatened / high degree and immediacy of threat)
.2	Fairly Endangered in California (20-80% occurrences Threatened)
.3	Not very Endangered in California (<20% of occurrences Threatened or no current threats known)

b Habitat information sources and blooming times - CNPS Inventory of Rare & Endangered Plants website (http://cnps.web.aplus.net/cgi-bin/inv/inventory.cgi) used for all plant species.
c Quad lists for plant species from March 2018 query of California Natural Diversity Database (CNDDB), supplemented for plants by the CNPS Inventory of Rare & Endangered Plants website, which notes quads species have been extirpated from (noted with an * in this table).
d Site survey from work conducted by Odell P& R on project site during Mach 2018.

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Fresno County, California

Local office

Sacramento Fish And Wildlife Office

(916) 414-6600
(916) 414-6713

Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Fresno Kangaroo Rat *Dipodomys nitratoides exilis* There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/5150	Endangered
San Joaquin Kit Fox *Vulpes macrotis mutica* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2873	Endangered

Birds

NAME	STATUS
Yellow-billed Cuckoo *Coccyzus americanus* There is **proposed** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3911	Threatened

Reptiles

NAME	STATUS
Blunt-nosed Leopard Lizard *Gambelia silus* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/625	Endangered
Giant Garter Snake *Thamnophis gigas* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4482	Threatened

Amphibians

NAME	STATUS

California Red-legged Frog Rana draytonii There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/2891	Threatened
California Tiger Salamander Ambystoma californiense There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/2076	Threatened

Fishes

NAME	STATUS
Delta Smelt Hypomesus transpacificus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/321	Threatened

Crustaceans

NAME	STATUS
Conservancy Fairy Shrimp Branchinecta conservatio There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8246	Endangered
Vernal Pool Fairy Shrimp Branchinecta lynchi There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/498	Threatened

Flowering Plants

NAME	STATUS
Greene's Tuctoria Tuctoria greenei There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/1573	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see maps of where birders and the general public have sighted birds in and around your project area, visit E-bird tools such as the E-bird data mapping tool (search for the name of a bird on your list to see specific locations where that bird has been reported to occur within your project area over a certain timeframe) and the E-bird Explore Data Tool (perform a query to see a list of all birds sighted in your county or region and within a certain timeframe). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Jan 1 to Aug 31
Black Swift Cypseloides niger This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8878	Breeds Jun 15 to Sep 10
Black-chinned Sparrow Spizella atrogularis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9447	Breeds Apr 15 to Jul 31
Burrowing Owl Athene cunicularia This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9737	Breeds Mar 15 to Aug 31
California Thrasher Toxostoma redivivum This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jan 1 to Jul 31
Clark's Grebe Aechmophorus clarkii This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jan 1 to Dec 31
Costa's Hummingbird Calypte costae This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9470	Breeds Jan 15 to Jun 10
Golden Eagle Aquila chrysaetos This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31
Lawrence's Goldfinch Carduelis lawrencei This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9464	Breeds Mar 20 to Sep 20
Lewis's Woodpecker Melanerpes lewis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9408	Breeds Apr 20 to Sep 30
Long-billed Curlew Numenius americanus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5511	Breeds elsewhere

Marbled Godwit Limosa fedoa — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9481

Mountain Plover Charadrius montanus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3638

Nuttall's Woodpecker Picoides nuttallii — Breeds Apr 1 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9410

Oak Titmouse Baeolophus inornatus — Breeds Mar 15 to Jul 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9656

Rufous Hummingbird selasphorus rufus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

Short-billed Dowitcher Limnodromus griseus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9480

Tricolored Blackbird Agelaius tricolor — Breeds Mar 15 to Aug 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3910

Whimbrel Numenius phaeopus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9483

White Headed Woodpecker Picoides albolarvatus — Breeds May 1 to Aug 15
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9411

Willet Tringa semipalmata — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Wrentit Chamaea fasciata — Breeds Mar 15 to Aug 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Yellow-billed Magpie Pica nuttalli — Breeds Apr 1 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9726

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in your project's counties during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20

for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season ( )

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the counties of your project area. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

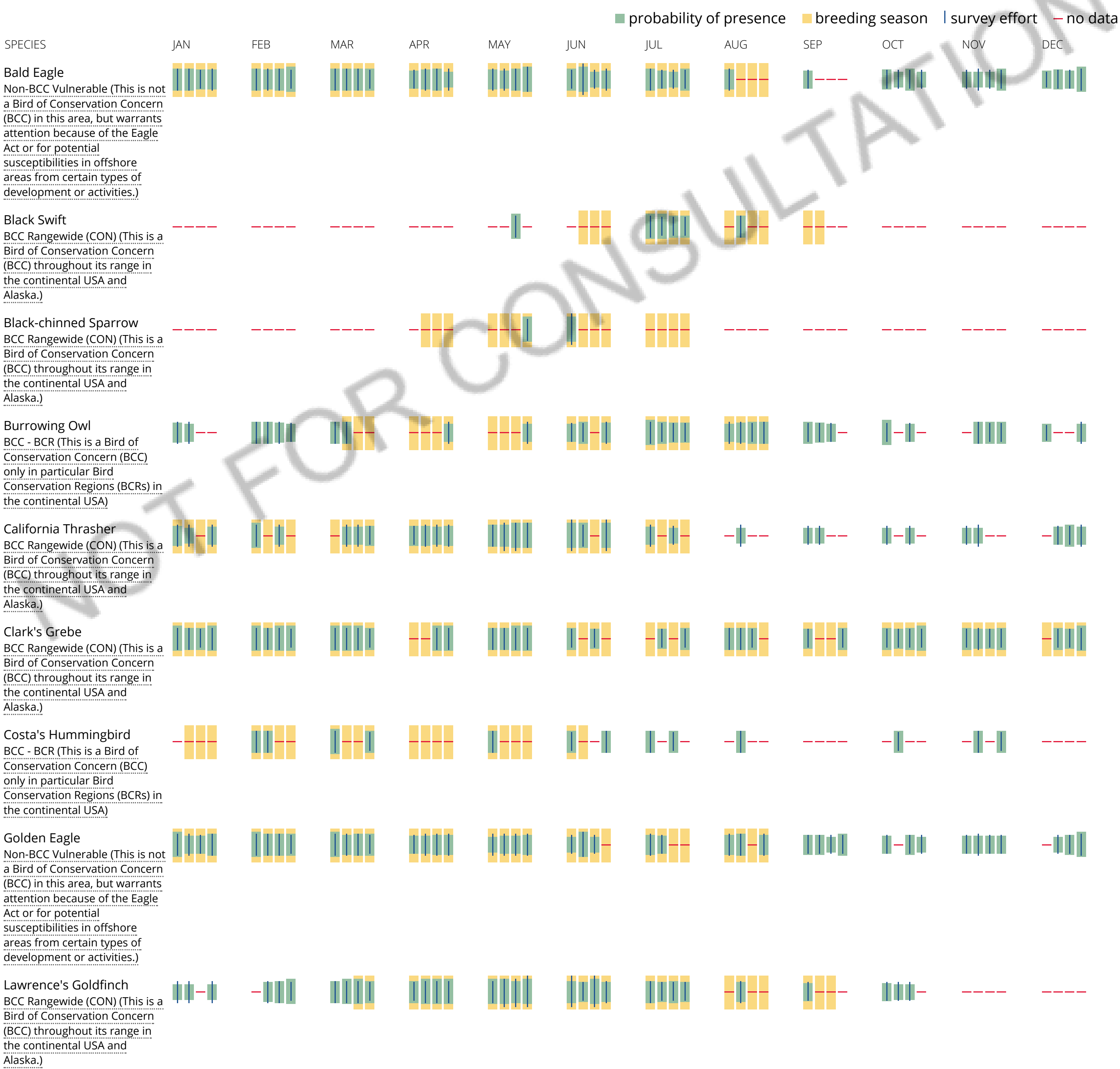
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information.



Lewis's Woodpecker
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Long-billed Curlew
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Marbled Godwit
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

SPECIES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Mountain Plover
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Nuttall's Woodpecker
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Oak Titmouse
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Rufous Hummingbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Short-billed Dowitcher
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Tricolored Blackbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Whimbrel
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

White Headed Woodpecker
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Willet
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Wrentit
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Yellow-billed Magpie
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the counties which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the E-bird Explore Data Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird entry on your migratory bird species list indicates a breeding season, it is probable that the bird breeds in your project's counties at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the BGEPA should such impacts occur.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

THERE ARE NO KNOWN WETLANDS AT THIS LOCATION.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

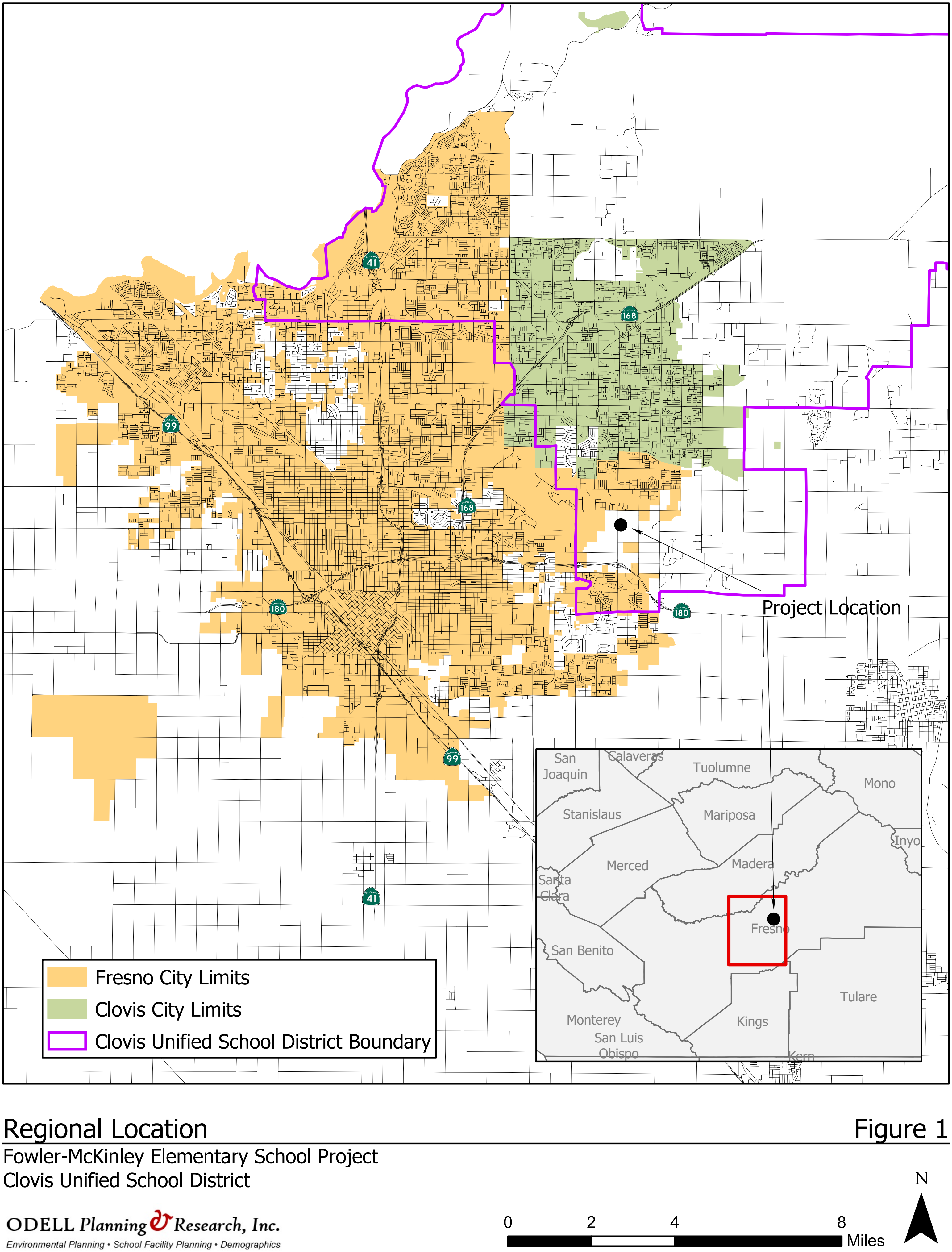
Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.



Regional Location

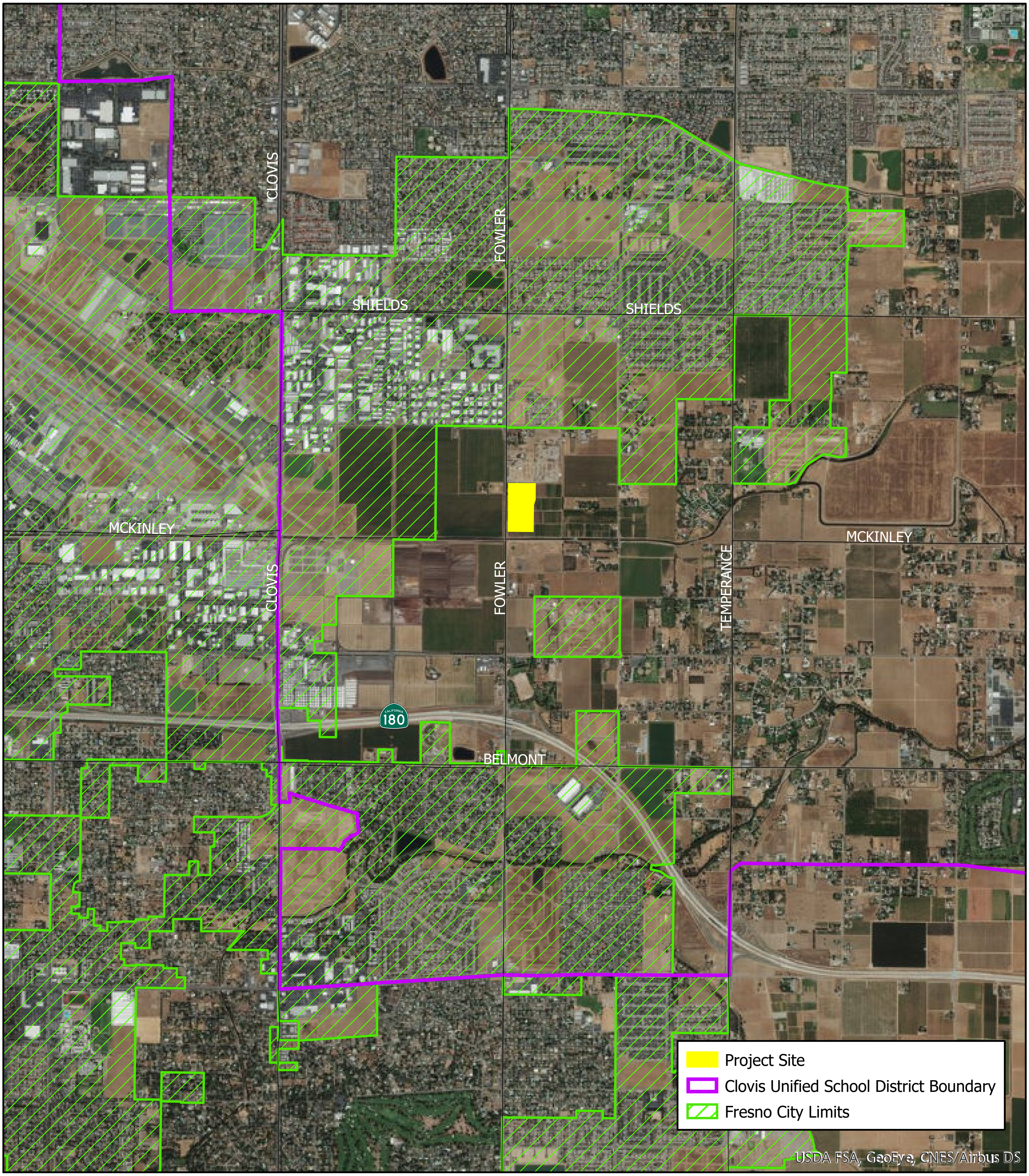
Figure 1

Fowler-McKinley Elementary School Project

Clovis Unified School District

ODELL Planning & Research, Inc.

Environmental Planning • School Facility Planning • Demographics

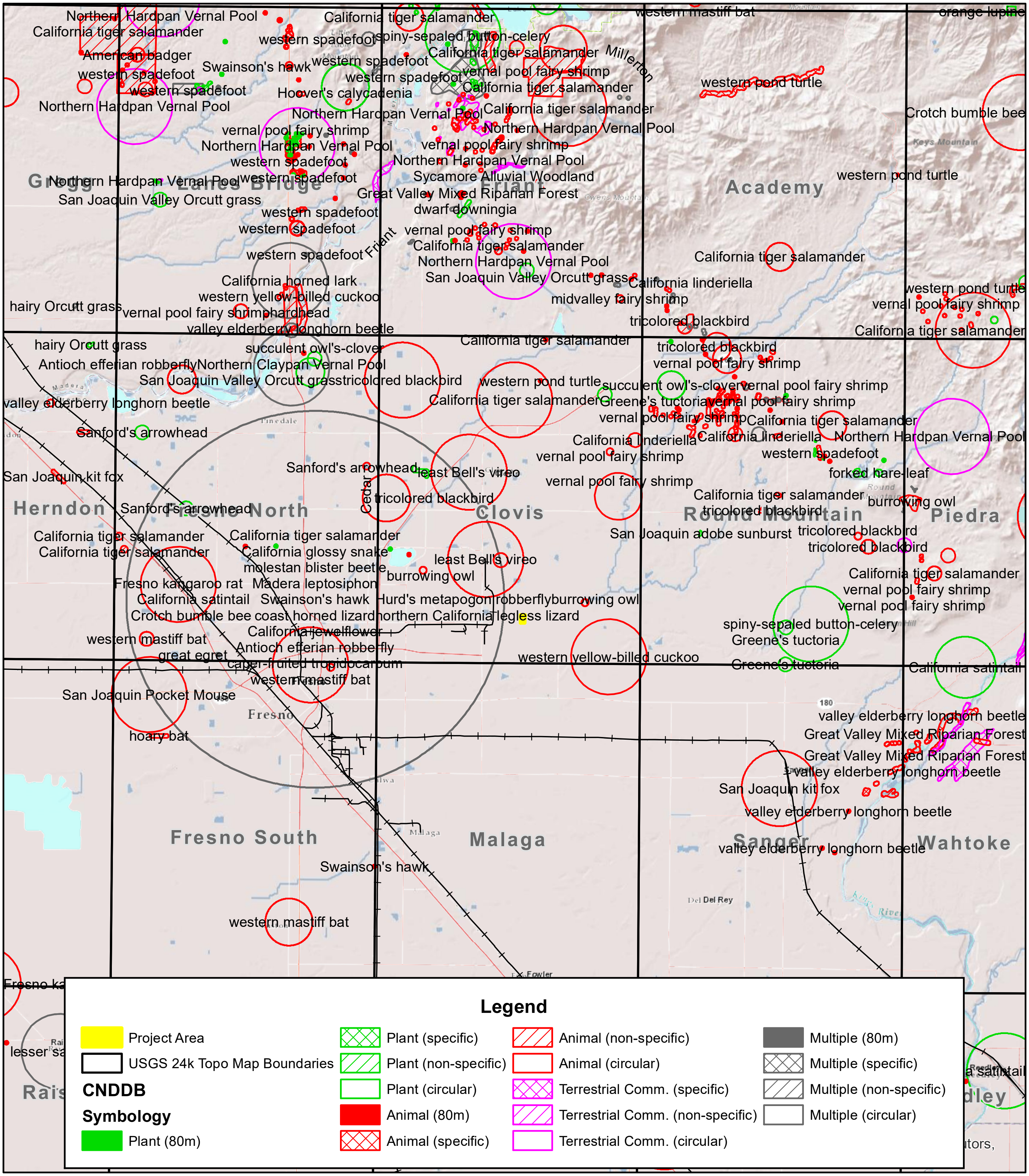


Project Location

Figure 2

Fowler-McKinley Elementary School Project
Clovis Unified School District

ODELL Planning & Research, Inc.
Environmental Planning • School Facility Planning • Demographics



Source: CDFW, CUSD, ESRI

California Natural Diversity Database (CNDDB) Map

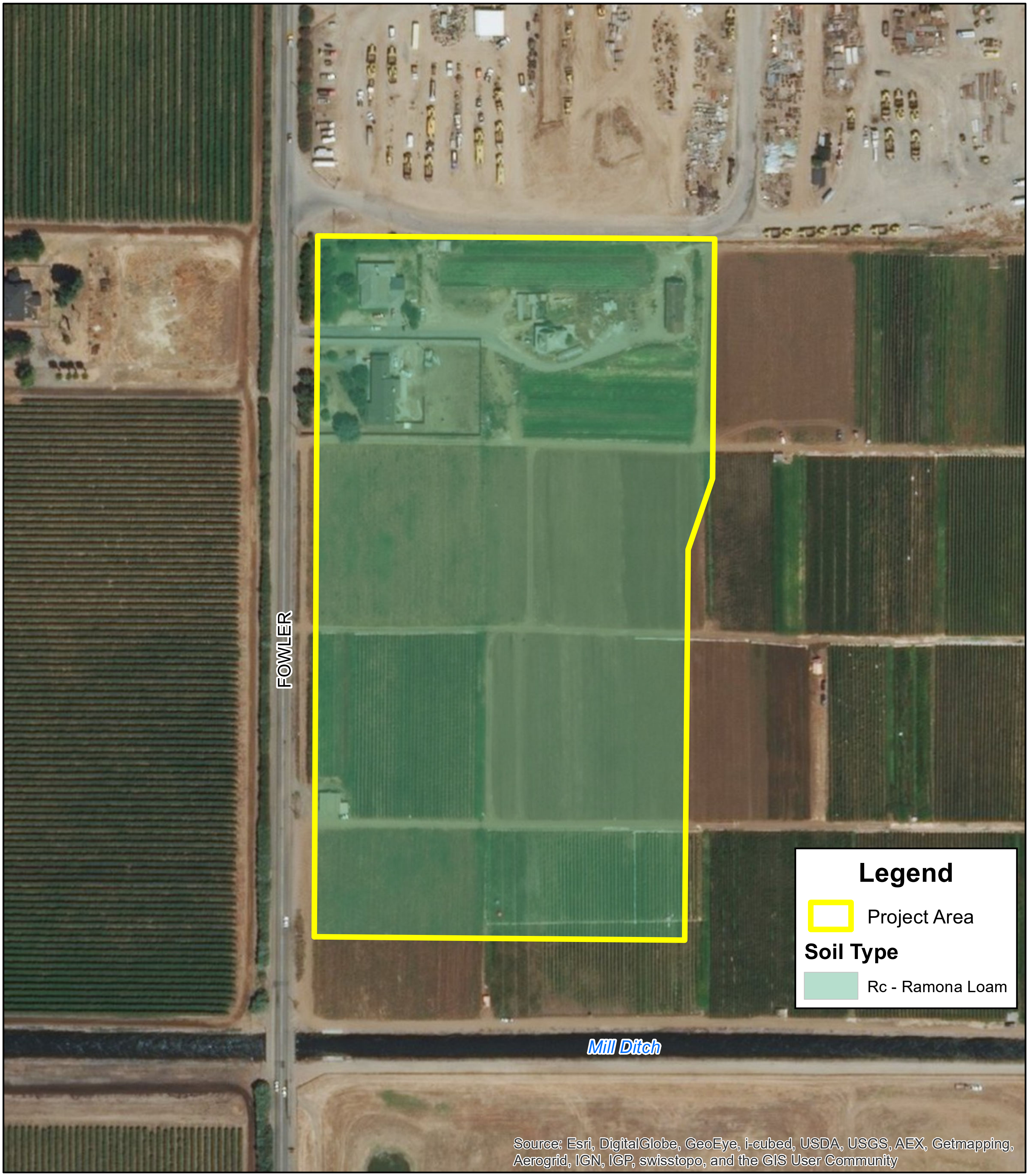
Figure 3

Fowler-McKinley Elementary School Project
Clovis Unified School District

ODELL Planning & Research, Inc.
School Facility Planning • Environmental Analysis • Demographics

N

0 0.75 1.5 3 4.5 6
Miles



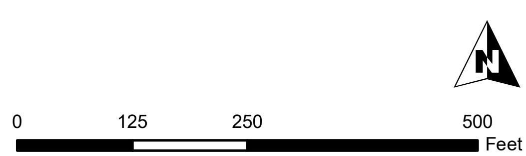
Source: USDA Web Soil Survey, County of Fresno, ESRI

Soils Map

Figure 4

Fowler-McKinley Elementary School Project
Clovis Unified School District

ODELL *Planning & Research, Inc.*



Appendix 3

Cultural Resources Survey

CULTURAL RESOURCES SURVEY OF A 22-ACRE PARCEL LOCATED AT THE NORTHEAST CORNER OF N. FOWLER AVENUE AND THE E. McKINLEY AVENUE ALIGNMENT, FRESNO COUNTY, CALIFORNIA

Prepared for:

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Prepared by:

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Sierra Valley Cultural Planning
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19 July 2018

USGS Topographic Quadrangle: Clovis, Calif., 7.5' (1978)

Area: 22 acres

(Keywords: Gashowu Yokuts, Pitkachi Yokuts, Eggers Colony, Mill Ditch Canal
Township 13S, Range 21E)

TABLE OF CONTENTS

SUMMARY OF FINDINGS

On March 20, 2018, a cultural resources survey was performed of a 22-acre parcel located on the northeast corner of Fowler Avenue and the proposed McKinley Avenue alignment in unincorporated land in Fresno County, California. The surveyed area, which is depicted on the USGS Clovis, Calif., 7.5' topographic quadrangle map, includes a portion of Section 27, Township 13S, Range 21E, MDB&M (see Maps 1-2).

The Clovis Unified School District is proposing to undertake the Fowler-McKinley Elementary School Project. The proposed project includes the acquisition of a 22-acre school site and the construction and operation of an elementary school on the site.

ODELL Planning & Research, Inc., is preparing environmental documents necessary under the California Environmental Quality Act (CEQA). Provisions and implementing guidelines of the CEQA, as amended March 18, 2010, state that identification and evaluation of historical resources is required for any action that may result in a potential adverse effect on the significance of such resources, which include archaeological resources.

Two historic-era structures, built prior to 1921, are located within the northeast corner of the 22-acre study area and include a two-story wood frame house on a concrete block foundation and a single-story rectangular-shaped wood frame barn/shed with a poured concrete floor. The house appears to have been unoccupied for quite some time and is in a poor state of repair; the original windows have been replaced with sliding aluminum windows. The barn is also in a poor condition. While the house does retain several architectural details, including an open wrap around front porch with wooden support pillars, decorative architectural details under the eaves, and a stylized roofline, it does not retain architectural integrity due to replacement of the original wood-framed fenestration with aluminum sliders and the addition of a single story shed at the rear of the house. The barn is a simple utilitarian structure lacking any particular stylistic elements. Neither structure appears eligible for listing on the National Register of Historic Places nor the California Register of Historic Resources; therefore no further study is recommended.

No significant or important archaeological or other cultural resources were identified as a result of this study. Therefore, it is unlikely that the proposed action will have an effect on important archaeological, historical, or other cultural resources. No further cultural resources investigation is therefore recommended. In the unlikely event that buried archaeological deposits are encountered within the project area, the finds must be evaluated by a qualified archaeologist. Should human remains be encountered, the County Coroner must be contacted immediately; if the remains are determined to be Native American, then the Native American Heritage Commission must be contacted as well.

INTRODUCTION

This report presents the findings of a pedestrian archaeological survey of a 22-acre parcel of land on the northeast corner of Fowler Avenue and the proposed McKinley Avenue alignment in unincorporated land in Fresno County, California. The surveyed area, which is depicted on the USGS Clovis, Calif., 7.5' topographic quadrangle map, includes a portion of Section 27, Township 13S, Range 21E, MDB&M (see Maps 1-2).

The Clovis Unified School District is proposing to undertake an elementary school construction project on the parcel. The cultural resources survey was performed at the request of Mr. Scott Odell of ODELL Planning & Research, Inc. ODELL Planning & Research, Inc., is preparing environmental documents necessary under the California Environmental Quality Act (CEQA). Provisions and implementing guidelines of the CEQA, as amended March 18, 2010, state that identification and evaluation of historical resources is required for any action that may result in a potential adverse effect on the significance of such resources, which include archaeological resources.

Sierra Valley Cultural Planning (SVCP) archaeologist Douglas S. McIntosh completed a systematic archaeological survey of the project Area of Potential Effect (APE). This report was completed by SVCP Principal Investigator C. Kristina Roper.

PROJECT LOCATION AND DESCRIPTION

The proposed 22-acre elementary school campus is located on the northeast corner of Fowler Avenue and the proposed McKinley Avenue alignment in unincorporated land in Fresno County, California. The project study area lies within Township 13S, Range 21E, Section 27, MDB&M (see Maps 1-2). The elementary school would serve up to 750 students in grades TK-6. The campus would have approximately 28 classrooms, administrative offices, a multi-purpose building, hardcourt areas and athletic fields. The project APE is depicted on Map 3.

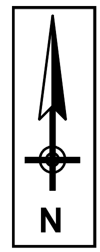
The Project APE is located southeast of the Fresno City boundaries in unincorporated Fresno County. The general setting is rural residential with large expanses of open agricultural fields. Two modern single-family homes are located within the northwest corner of the parcel at 2200 and 2204 N. Fowler Avenue. An older, unoccupied single-family residence and barn are location in the northeast corner of the parcel. North of the site is a storage and repair yards of earth-moving equipment. One quarter mile north of the study area is a subdivision of recently-constructed single-family homes and a light-industrial/commercial area. Mill Ditch is located immediately south of the study area. Photos 1 through 6 provide a pictorial overview of the project APE.

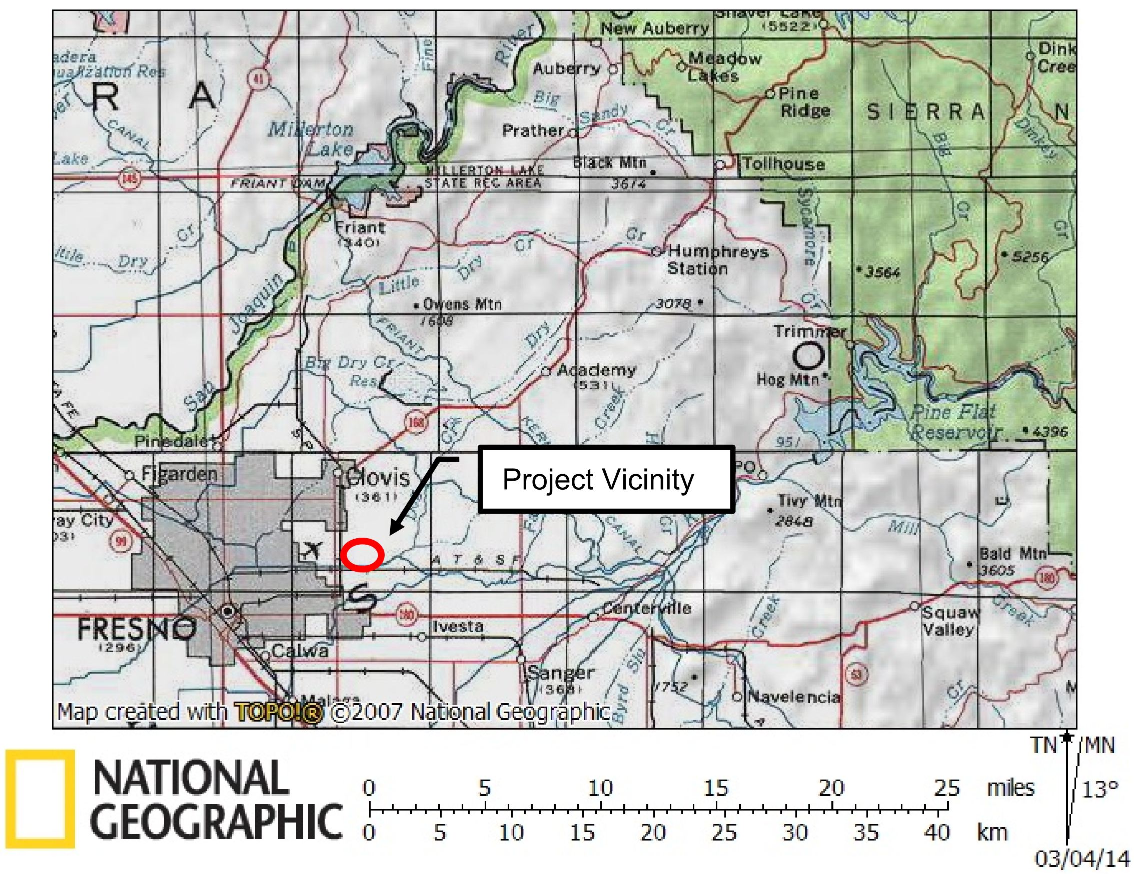
SOURCES CONSULTED

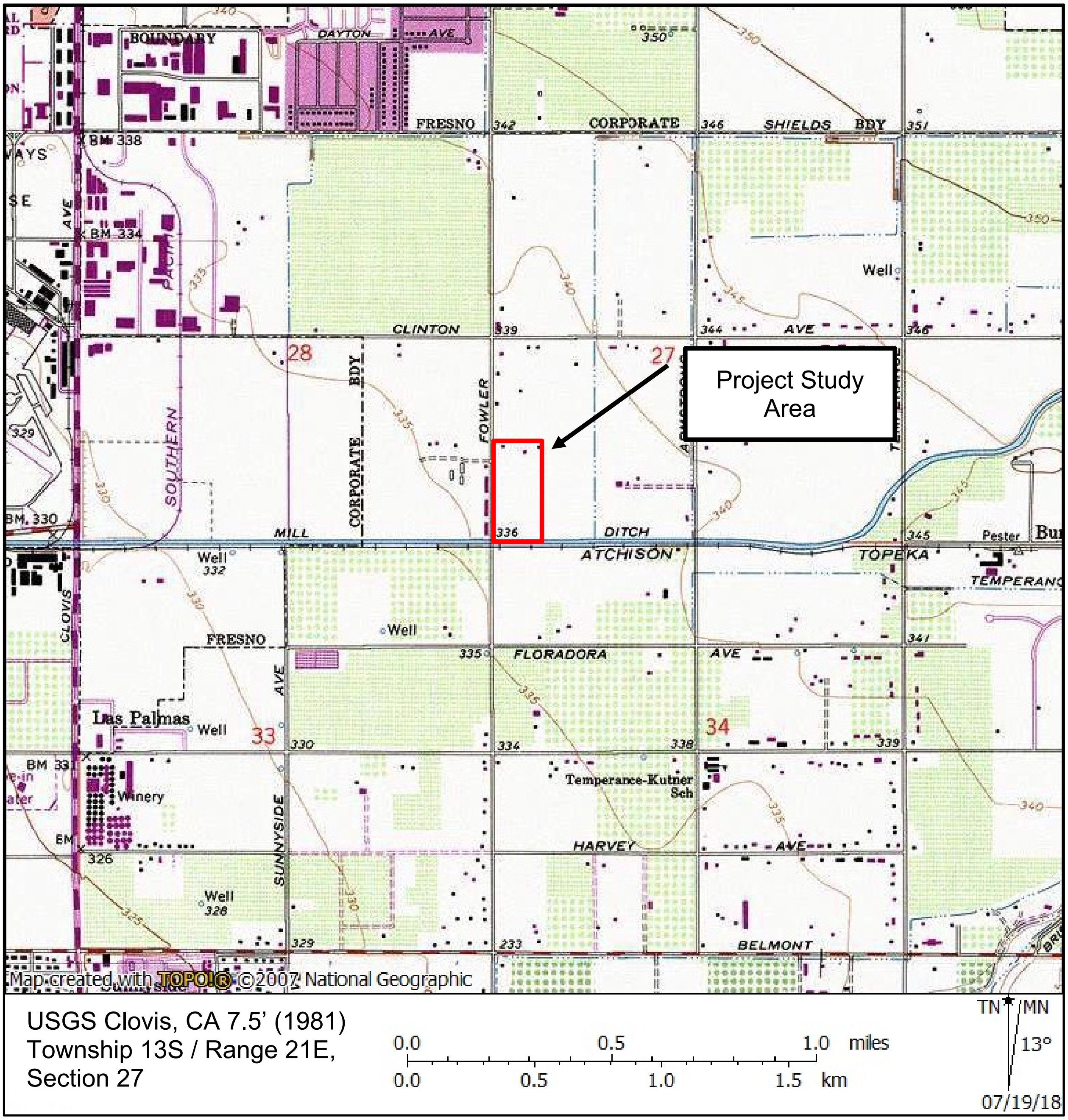
Prior to field inspection, an in-house records search was completed by Mr. McIntosh at the Southern San Joaquin Valley Information Center (SSJVIC) of the California Historical Resources Information System to identify areas previously investigated and to identify known cultural resources present within or in close proximity to the Project APE. According to the Information Center records, there are no prehistoric or historic-period sites or structures identified

MAP 1. PROJECT VICINITY

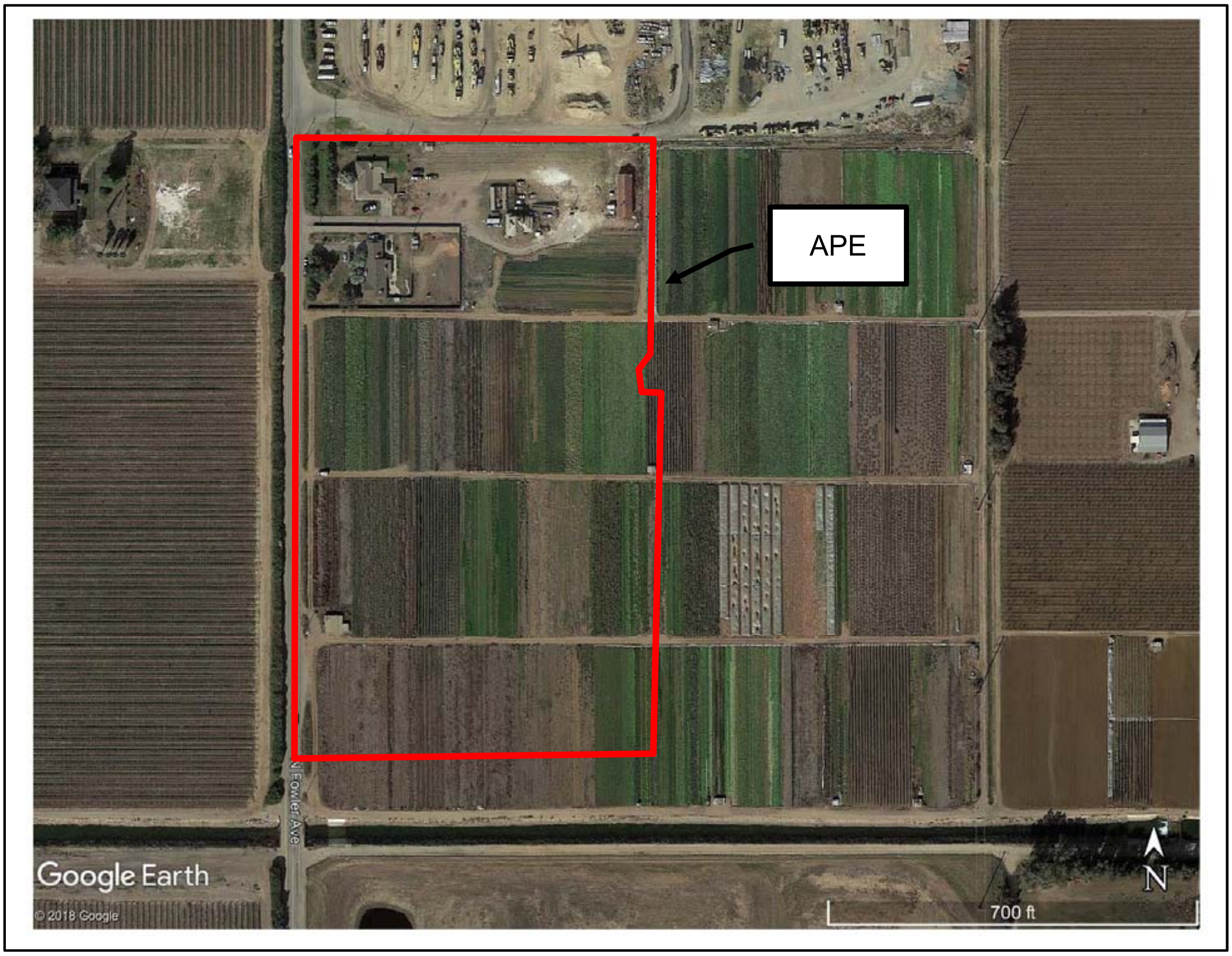
Fowler-McKinley Elementary School
N. Fowler Avenue north of E. McKinley Avenue
alignment, Fresno County, CA.







Map 2. Project Study Area, Fowler-McKinley Elementary School, N. Fowler Avenue north of E. McKinley Avenue alignment, Fresno County, California.



Map 3. Project Area of Potential Effects (APE).

within the project APE, and no resources are identified within a ½-mile radius of the study area. There have been have been no previous investigation within the APE, and none within a ½-mile radius of the parcel. No cultural resource sites listed on the National Register of Historic Places, the California Register of Historic Resources, California Points of Historical Interest, State Historic Landmarks, or the California Inventory of Historic Resources have been documented either in or within ½-mile radius of the project APE.


Photo 1. View N from center of parcel.


Photo 2. View S from center of parcel.


Photo 3. View E from center of parcel.


Photo 4. View W from center of parcel.


Photo 5. View S from NW corner of parcel.


Photo 6. View N from SW parcel corner, fruit stand at left.

BACKGROUND

Prior to EuroAmerican exploration and settlement in the region, the central San Joaquin Valley was extensive grassland covered with spring-flowering herbs. Stands of trees -- sycamore, cottonwoods, box elders and willows -- lined the stream and river courses with groves of valley oaks in well-watered localities with rich soil. Rivers yielded fish, mussels, and pond turtles; migratory waterfowl nested in the dense tules along the river sloughs downstream. When the Spanish first set foot in the area, they found the deer and tule elk trails to be so broad and extensive that they first supposed that the area was occupied by cattle. Grizzly bears occupied the open grassland and riparian corridors on the valley floor and adjacent foothills. Smaller mammals and birds, including jackrabbits, ground squirrels, and quail were abundant. Native Americans occupants of the region describe abundant sedge beds, along with rich areas of deer grass, plants that figure prominently in the construction of Native American basketry items.

Prehistoric Period Summary

The San Joaquin Valley and adjacent Sierran foothills and Coast Range have a long and complex cultural history with distinct regional patterns that extend back more than 11,000 years (McGuire 1995). The first generally agreed-upon evidence for the presence of prehistoric peoples in the region is represented by the distinctive basally-thinned and fluted projectile points, found on the margins of extinct lakes in the San Joaquin Valley. These projectiles, often compared to Clovis points, have been found at three localities in the San Joaquin Valley including along the Pleistocene shorelines of former Tulare Lake. Based on evidence from these sites and other well-dated contexts elsewhere, these Paleo-Indian hunters who used these spear points existed during a narrow time range of 11550 cal B.C. to 8550 cal B.C. (Rosenthal et al. 2007).

As a result of climate change at the end of the Pleistocene, a period of extensive deposition occurred throughout the lowlands of central California, burying many older landforms and providing a distinct break between Pleistocene and subsequent occupations during the Holocene. Another period of deposition, also a product of climate change, had similar results around 7550 cal B.C., burying some of the oldest archaeological deposits discovered in California (Rosenthal and Meyer 2004).

The Lower Archaic (8550-5550 cal B.C.) is characterized by an apparent contrast in economies, although it is possible they may be seasonal expressions of the same economy. Archaeological deposits which date to this period on the valley floor frequently include only large stemmed spear points, suggesting an emphasis on large game such as artiodactyls (Wallace 1991). Recent discoveries in the adjacent Sierra Nevada have yielded distinct milling assemblages which clearly indicate a reliance on plant foods. Investigations at Copperopolis (LaJeunesse and Pryor 1996) argue that nut crops were the primary target of seasonal plant exploitation. Assemblages at these foothill sites include dense accumulations of handstones, millingslabs, and various cobble-core tools, representing “frequently visited camps in a seasonally structured settlement system” (Rosenthal et al. 2007:152). During the Lower Archaic, regional interaction spheres were well established. Marine shell from the central California coast has been found in early Holocene contexts in the Great Basin east of the Sierra Nevada, and eastern Sierra obsidian comprises a large percentage of flaked stone debitage and tools recovered from sites on both sides of the Sierra (Rosenthal et al. 2007:152).

About 8,000 years ago, many California cultures shifted the main focus of their subsistence strategies from hunting to nut and seed gathering, as evidenced by the increase in food-grinding implements found in archeological sites dating to this period. This cultural pattern is best known for southern California, where it has been termed the Milling Stone Horizon (Wallace 1954, 1978a), but recent studies suggest that the horizon may be more widespread than originally described and is found throughout the central region during the Middle Archaic Period. Dates associated with this period vary between 9,000 and 2,000 cal BP, although most cluster in the 6,800 to 4,500 cal BP range (Basgall and True 1985).

On the valley floor, early Middle Archaic sites are relatively rare; this changes significantly toward the end of the Middle Archaic. In central California late Middle Archaic settlement focused on river courses on the valley floor. “Extended residential settlement at these sites is indicated by refined and specialized tool assemblages and features, a wide range of nonutilitarian artifacts, abundant trade objects, and plant and animal remains indicative of year-round occupation” (Rosenthal et al. 2007:154). Again, climate change apparently influence this shift, with warmer, drier conditions prevailing throughout California. The shorelines of many lakes, including Tulare Lake, contracted substantially, while at the same time rising sea levels favored the expansion of the San Joaquin/Sacramento Delta region, with newly formed wetlands extending eastward from the San Francisco Bay.

In contrast with rare early Middle Archaic sites on the valley floor, early Middle Archaic sites are relatively common in the Sierran foothills, and their recovered, mainly utilitarian assemblages show relatively little change from the preceding period with a continued emphasis on acorns and pine nuts. Few bone or shell artifacts, beads, or ornaments have been recovered from these localities. Projectile points from this period reflect a high degree of regional morphological variability, with an emphasis on local toolstone material supplemented with a small amount of obsidian from eastern sources. In contrast with the more elaborate mortuary assemblages and extended burial mode documented at Valley sites, burials sites documented at some foothill sites such as CA-FRE-61 on Wahtoke Creek are reminiscent of “re-burial” features reported from Milling Stone Horizon sites in southern California. These re-burials are characterized by re-interment of incomplete skeletons often capped with inverted millingstones (McGuire 1995:57).

A return to colder and wetter conditions marked the Upper Archaic in Central California (550 cal B.C. to cal A.D. 1100). Previously desiccated lakes returned to spill levels and increased freshwater flowed in the San Joaquin and Sacramento watershed. Cultural patterns as reflected in the archeological record, particularly specialized subsistence practices, emerged during this period. The archeological record becomes more complex, as specialized adaptations to locally available resources were developed and valley populations expanded into the lower Sierran foothills. New and specialized technologies expanded and distinct shell bead types occurred across the region. The range of subsistence resources utilized and exchange systems expanded significantly from the previous period. In the Central Valley, archaeological evidence of social stratification and craft specialization is indicated by well-made artifacts such as charmstones and beads, often found as mortuary items.

The period between approximately cal A.D. 1000 and Euro-American contact is referred to as the Emergent Period. The Emergent Period is marked by the introduction of bow and arrow technology which replaced the dart and atlatl at about cal A.D. 1000 and 1300. In the San Joaquin region, villages and small residential sites developed along the many stream courses in the lower foothills and along the river channels and sloughs of the valley floor. A local form of pottery was developed in the southern Sierran foothills along the Kaweah River. Archaeological excavations at habitation sites in Merced and Fresno counties have revealed an artifact assemblage belonging to the Yokuts groups who inhabited the valley floor and adjacent foothills into historic times (Olsen and Payen 1968, 1969; Pritchard 1970).

Ethnographic Summary

Prior to EuroAmerican settlement, most of the San Joaquin Valley and the bordering foothills of the Sierra Nevada and Coastal Range were inhabited by speakers of Yokutsan languages. The southern San Joaquin Valley was home of speakers of Yokutsan languages. The bulk of the Valley Yokuts people lived on the eastern side of the San Joaquin Valley. The project APE falls within the territory of the *Gashowu* Yokuts. The *Gashowu* occupied the area centering on Big Dry Creek. The *Pitkachi*, a Northern Valley Yokuts tribelet, occupied the southern side of the San Joaquin River extending up and down river from the town of Herndon (Latta 1999:161). Population densities were highest in the eastern valley and adjacent Sierra Nevada foothills, with as many as 10+ people per square mile living along a narrow strip bordering the San Joaquin and its tributaries (Baumhoff 1963: map 7). No village or other named sites are identified within one mile radius of the Project APE.

Numerous accounts of Valley Yokuts lifeways offer details of pre-European land use in the San Joaquin Valley. The reader is referred to Gayton (1948), Kroeber (1925), Latta (1999), and Wallace (1978b) for additional information on pre-contact Yokuts subsistence and culture.

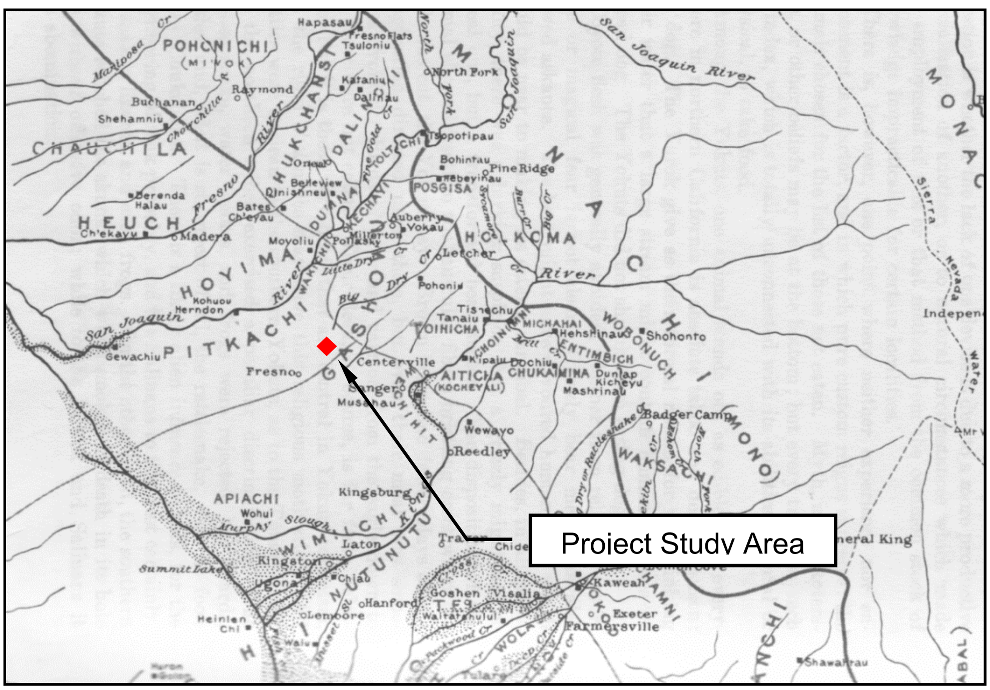


Figure 5. Northern Valley Yokuts Village Locations (from Kroeber 1925: Plate 47).

Historic Period Summary

The eastern San Joaquin Valley was visited in the early 1800s by Spanish expeditions exploring the interior in search of potential mission sites. The Jose Joaquin Moraga and Juan Bautista Anza expeditions of 1776 may have passed through the region, followed by subsequent expeditions in 1805 and later (Cook 1955, 1962). In 1832-33 Colonel Jose J. Warner, a member of the Ewing-Young trapping expedition, passed through the San Joaquin Valley. Warner described Native villages densely packed along the San Joaquin, from the foothills down into the slough area. The next year he revisited the area following a devastating malaria epidemic. Whereas the previous year the region had been densely occupied by Native peoples, during this trip not more than five Indians were observed between the head of the Sacramento Valley and the Kings River (Phillips 1993:94).

EuroAmerican settlement of the region began in 1851 with the establishment of Fort Miller on the San Joaquin River. Hostilities between Native inhabitants and American settlers initially prevented widespread settlement of the region; however, by 1860 such threats had been reduced and settlers began taking up large tracts in the region.

The settlement of the City of Fresno in the 1870s concentrated population several miles south of the San Joaquin River. Prior to the last decades of the twentieth century, land use in the vicinity of the Project APE was limited to agricultural use, made possible through the development of a series of irrigation ditches that brought water from the Kings River to the plains around Fresno and Clovis. The Mill Ditch was built in 1878 by Moses J. Church to power his Champion Flour Mill at the corner of Fresno and N streets (Clough and Secrest 1984:119). An 1891 map of the project vicinity depicts the entire Section 27 under the ownership of George H. Eggers, who laid out parcels included within the Eggers Colony following a system of land development started in Fresno County by Bernard Marks in 1876 (Thompson 1891; FCCHS 1979:9).

METHODS AND FINDINGS

On March 20, 2018, Sierra Valley Cultural Resources archaeologist Douglas S. McIntosh, under the direction of Project Manager C. Kristina Roper, conducted a systematic archaeological pedestrian survey of the 22-acre parcel. This survey was conducted to assess the potential effects on cultural resources of a proposed commercial development by Westgate Development, Inc. The subject parcel is located within unincorporated lands south and east of the City of Fresno on N. Fowler Avenue northeast of the E. McKinley Avenue alignment.

The survey sought to identify any archaeological sites, features and artifacts which might be present of the ground surface. Items such as chipped stone tools, grinding implements, hearths and midden deposits are indicators or prehistoric activities. In addition, the survey also sought to identify any historic artifacts, features or structures over fifty years old.

The pedestrian survey entailed walking systematic east to west transects across the entire 22-acre parcel. These transects were spaced 10 to 12 meters apart. A Panasonic DMC-TS20 digital camera was used to photo document the project setting. All photo information was recorded in the field on a photo-log.

Ground surface visibility varied across the 22-acre parcel. Within the northern portion of the parcel surface visibility was limited as a result of the built environment, including standing structures, paved surfaces, landscaping, and parked equipment. Surface visibility within the cultivated agricultural fields varied from 0 to 100 percent. The portions of the fields which are under cultivation had extremely poor visibility. Areas were crops had been harvested and soils recently disked had excellent ground surface visibility. Project soils are a silty clay loam. Inspected soils have a general Munsell color value of 10yr ¾, dark brown (wet). Fragments of plastic sheeting and irrigation tubing were present across the agricultural portion of the site.

Two modern single-family homes are located at the northwest corner of the parcel at 2200 and 2204 N. Fowler Avenue. A wooden fruit stand is located on N. Fowler near the SW corner of the parcel. Two historic-era structures, built prior to 1921, are located within the northeast corner of the 22-acre study area and include a two-story wood frame house on a concrete block foundation and a single-story, rectangular-shaped wood frame barn/shed with a poured concrete floor. The house appears to have been unoccupied for quite some time and is in a poor state of repair; the original windows have been replaced with sliding aluminum windows. The barn is also in a poor condition. While the house does retain several architectural details, including an open wrap around front porch with wooden support pillars, decorative architectural details under the eaves, and a stylized roofline, it does not retain architectural integrity due to replacement of the original wood-framed fenestration with modern aluminum sliders and the addition of a single story shed at the rear of the house. The barn is a simple utilitarian shed lacking any particular stylistic elements. Neither structure appears eligible for listing on the National Register of Historic Places nor the California Register of Historic Resources; therefore no further study is recommended. The structures are depicted in Photos 7-12 with locations plotted on Map 4.

Summary of Findings

No significant or important archaeological or other cultural resources were identified as a result of this study. Therefore, it is unlikely that the proposed action will have an effect on important archaeological, historical, or other cultural resources. No further cultural resources investigation is therefore recommended. In the unlikely event that buried archaeological deposits are encountered within the project area, the finds must be evaluated by a qualified archaeologist. Should human remains be encountered, the County Coroner must be contacted immediately; if the remains are determined to be Native American, then the Native American Heritage Commission must be contacted as well.

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Photo 7. View ENE toward residence at 2204 N. Fowler Avenue.

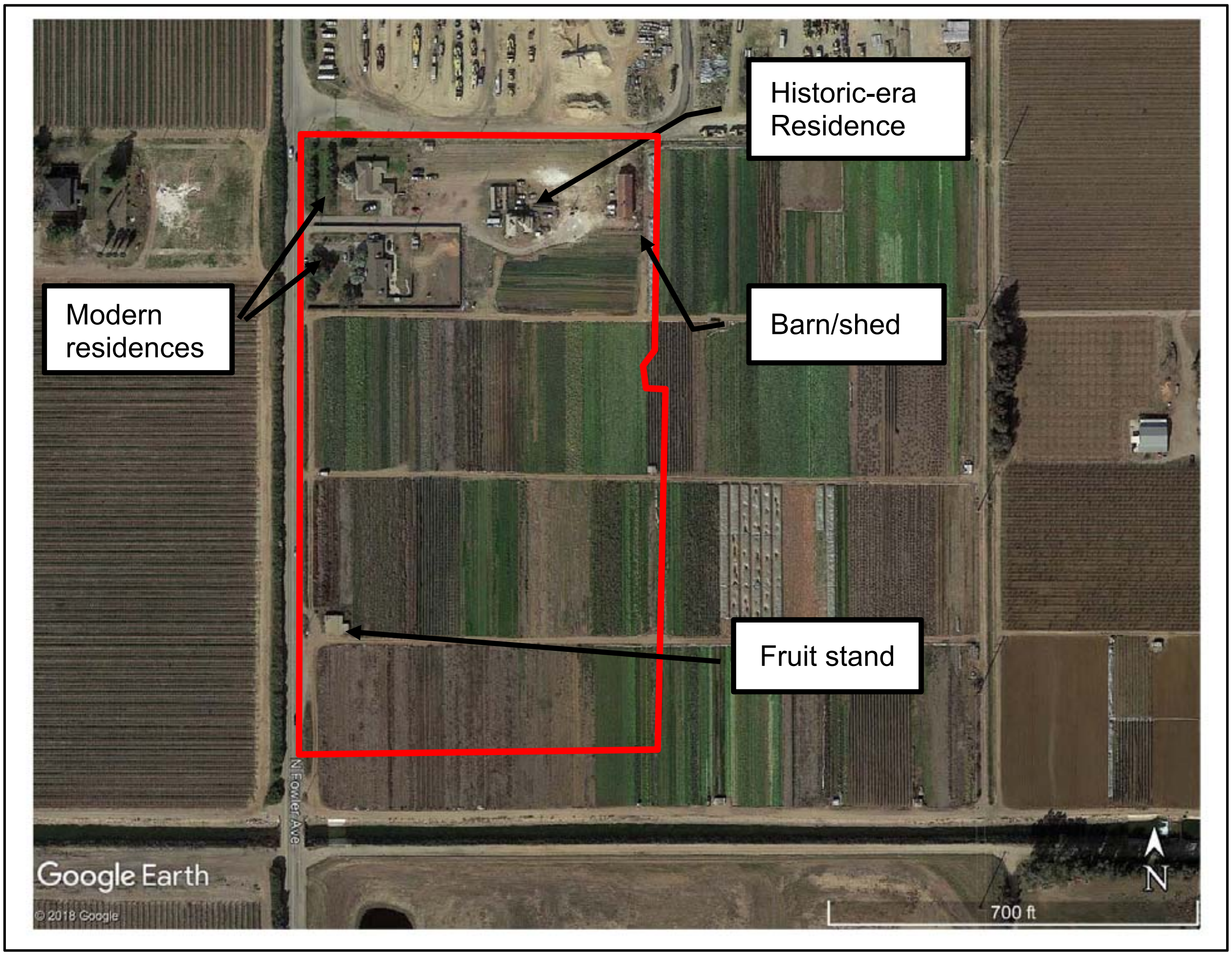
Photo 8. View E toward residence at 2200 N. Fowler Ave.

Photo 9. View NE toward historic-era residence and barn.

Photo 10. View N toward historic-era residence. Note modern windows and addition at right.

Photo 11. View SE toward barn.

Photo 12. View NE toward fruit stand on east side of N. Fowler Ave.



Map 4. Location of historic-era and modern structures.

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PREPARER'S QUALIFICATIONS

Douglas S. McIntosh completed the archaeological survey of the Project APE. Mr. McIntosh has over 26 years of experience in California archaeology and has served as field crew chief and lead field assistant for both historical and prehistoric resource investigations, including tasks of surveying, field mapping, excavation, field graphics, soils descriptions, photography, and general site documentation. He has served as an archaeological monitor for various aspects of earthmoving and grading activities for cultural resources, and as Laboratory assistant for both historical and prehistoric resources which includes processing soil samples, cleaning and cataloging historical and prehistoric artifacts and collections, and artifact illustration. Mr. McIntosh has conducted historical research which involves records, maps and archival searches, oral interviews, and documentation of historical photographic collections.

C. Kristina Roper meets the Secretary of the Interior's Guidelines for archaeology. Ms. Roper has a B.A. in Anthropology from the University of California, Berkeley, and a M.A. in Cultural Resources Management from Sonoma State University. She has over 36 years of archaeological survey and excavation experience, including both prehistoric and historic sites, in California, Nevada, Oregon, and Idaho, and has produced over 250 professional reports. For the past 21 years Ms. Roper has served as a Lecturer in Anthropology at California State University, Fresno. Ms. Roper is a Registered Professional Archaeologist in good standing. As sole proprietor of a cultural resources management firm established in 1995, her responsibilities include all aspects of project management, from marketing and development, to project completion, and include NEPA, CEQA, and NHPA (Section 106) compliance.

Appendix 4

Geological/Environmental Hazards Report

AECOM

GEOLOGICAL/ENVIRONMENTAL HAZARDS REPORT
Planned Fowler-McKinley Elementary School
22 Acres at Northeast Corner of Fowler & McKinley Avenues
Fresno County, California

Prepared for:
Clovis Unified School District

August 22, 2018

AECOM – Fresno, California
Project No. 60577797

AECOM

August 22, 2018

Mr. Kevin Peterson
Assistant Superintendent, Facility Services
Clovis Unified School District
1450 Herndon Avenue
Clovis, California 93611

**Subject: Geological/Environmental Hazards Report
Planned Fowler-McKinley Elementary School
22 Acres at Northeast Corner of Fowler & McKinley Avenues
Fresno County, California
(AECOM Project No. 60577797)**

Dear Mr. Peterson:

AECOM Technical Services, Inc. prepared the enclosed report on behalf of the Clovis Unified School District (CUSD, Client) in accordance with the scope of services you authorized by approval of our April 27, 2018 proposal. The report presents the methods and results of a geological/environmental hazards investigation of the subject planned school site.

Please do not hesitate to contact me at 559-490-8308 if you have any questions. We very much appreciate your selection of AECOM for this project.

Sincerely,
AECOM Technical Services, Inc.

Stuart St. Clair

Stuart B. St. Clair, PE
Project Civil Engineer/Project Manager

REGISTERED PROFESSIONAL ENGINEER
STUART BRIAN ST CLAIR
No. C 60945
Exp. 12/31/18
CIVIL
STATE OF CALIFORNIA

Enclosure

c: Scott Odell, AICP, Odell Planning & Research, Inc.

AECOM Technical Services, Inc.
1360 E. Spruce Avenue, Suite 101
Fresno, CA 93720
Tel: 559-448-8222
Fax: 559-448-8233

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APPENDICES

1.0 INTRODUCTION

AECOM Technical Services, Inc. (AECOM) prepared this Geological/Environmental Hazards Report for the planned elementary school (the "site") comprising approximately 22 acres of land located on the east side of North Fowler Avenue, and north of the McKinley Avenue alignment, east of the City of Fresno in Fresno County, California (Figure 1). This report was prepared by AECOM on behalf of the Clovis Unified School District (CUSD, Client). AECOM is also concurrently conducting a Preliminary Environmental Assessment (PEA) for the site. The results of the PEA will be presented in a separate report.

This Report is organized as follows:

- Section 1.0 presents an introduction to the project.
- Section 2.0 presents the objective and scope of the project.
- Section 3.0 presents the site location and description.
- Section 4.0 presents the site's geologic setting.
- Section 5.0 presents engineering geology and seismology findings.
- Section 6.0 presents environmental hazards findings.
- Section 7.0 presents a summary of the findings and recommendations.
- Section 8.0 presents limitations of this report.
- Section 9.0 presents relevant references.
- Tables, figures and appendices follow Section 9.0.

2.0 OBJECTIVE AND SCOPE

The objective of AECOM's evaluation was to assess whether the site is subject to geological hazards that may require project mitigation, as set forth in California Education Code (CEC) sections 17212 and 17212.5 and in California Code of Regulations (CCR), Title 5 section 14010(f), (g) and (i). In particular, AECOM evaluated the following questions:

- Is the site located within the boundaries of an Earthquake Fault Zone designated by California Geological Survey (CGS) under the Alquist-Priolo Earthquake Fault Zoning Act, or within an area designated as geologically hazardous in the safety element of the local general plan?
- Does the site contain an active earthquake fault or fault trace (i.e., a fault or fault trace along which surface rupture can reasonably be expected to occur within the life of the school)?
- Is the site potentially subject to significant ground shaking due to nearby faults or fault traces?
- Is the site potentially subject to significant liquefaction or seismic settlement?
- Is the site potentially at risk due to expansive soils?
- Is the site potentially subject to landslides or other slope stability issues?
- Is the site potentially subject to subsidence or hydrocollapse of soils?
- Is the site potentially at risk due to flooding or dam inundation?
- Is the site potentially at risk due to tsunami or seiche inundation?
- Is the site potentially at risk due to volcanic eruption?

AECOM also evaluated the following potential environmental hazards, as set forth in CEC sections 17212.2 and 17213 and in Title 5 CCR section 14010(c), (h), and (q):

- Hazardous pipelines located within 1,500 feet of the site.
- Electrical power lines of greater than 50 kilovolts located within 350 feet of the site.
- Hazardous air emitters or hazardous material handlers located within ¼ mile of the site.
- Aboveground storage tanks for water or fuel (gasoline/diesel/propane) located within ¼ mile of the site.
- Railroad tracks located within 1,500 feet of the site.

Data collection for this report included review of publicly available geologic references and maps, inquiries with local utility companies and state and local agencies, and visual review of the site and properties near the site as viewable from the site or public roadways.

The Geological/Environmental Hazards Report complies with California legal requirements and guidelines for planned school sites, and was prepared under the supervision of, and is signed by, a California-registered civil engineer or geologist experienced in such assessments. For potentially significant geologic/seismic hazards identified at the site, potential mitigation measures are discussed at a conceptual level in the report. Preparation of design-level mitigation measures would require supplemental exploration and analysis beyond the scope of services presented in this report. AECOM can provide a separate proposal for such services, if needed.

3.0 SITE LOCATION AND DESCRIPTION

The site is located on the east side of North Fowler Avenue, and north of the McKinley Avenue alignment, east of the City of Fresno in Fresno County, California (Figure 1). The 22-acre site consists of all of the parcel having Fresno County Assessor's Parcel Number (APN) 310-041-15 and slightly over half of the parcel having APN 310-041-17. The assessor's map is provided in Appendix A. The site is in the west half of the southwest quarter of Section 27, Township 13 South, Range 21 East, Mount Diablo Baseline and Meridian [USGS, 2015].

The site has three residential structures and a barn, with the remainder of the property used as cropland.

Land use adjacent to the site consists of a heavy equipment laydown and material storage yard to the north; cropland to the east; an irrigation canal to the south with cropland beyond; and North Fowler Avenue to the west with a residence and cropland beyond.

4.0 GEOLOGIC SETTING

This section summarizes available information on the topography, geology, and hydrology of the site and vicinity.

4.1 TOPOGRAPHY

The site is located in the San Joaquin Valley at an elevation of about 335 feet above mean sea level (amsl) [USGS, 2015]. The topography in the vicinity of the site is relatively flat and level, sloping gently downward to the southwest at approximately 10 feet per mile.

4.2 GEOLOGY

4.2.1 Regional Geology

The site lies near the eastern edge of the Great Valley Geomorphic Province of California. The valley is approximately 400 miles long and averages 50 miles wide. The valley has been filled with a thick sequence of marine and nonmarine sediments dating from the late Jurassic to the Holocene periods. The uppermost strata of the Great Valley represent, for the most part, the alluvial, flood, and delta plains of two major rivers, the Sacramento River in the north and the San Joaquin River in the south, and their tributaries.

The valley deposits are derived from the Coast Ranges to the west and the Sierra Nevada to the east. Granitic and metamorphic rocks outcrop along the eastern and southeastern flanks of the valley. Marine sedimentary rocks outcrop along most of the western, southwestern, and southern flanks; and volcanic rocks and deposits outcrop along the northeastern flanks of the valley. The valley geomorphology includes dissected uplands, low alluvial plains and fans, river flood plains and channels, and overflow lands and lake bottoms.

The San Joaquin Valley is a synclinal structure between the tilted block of the Sierra Nevada on the east and the complexly folded and faulted Coast Ranges on the west. The Sierra Nevada is uplifted along its eastern flank and depressed along its western flank where it is overlain by sedimentary deposits of the San Joaquin Valley. Beneath the San Joaquin Valley, a westwardly thickening wedge of sediments overlies crystalline basement rocks similar to those exposed in the Sierra Nevada. Indirect evidence suggests that the Sierra Nevada block extends westward to the flanks of the Coast Ranges [Miller et al., 1971].

The large northwest-trending syncline between the Sierra Nevada and the Coast Ranges is the principal late Cenozoic structure in the San Joaquin Valley. The axial plane of the syncline has subsided at a minimum rate of 0.7 to 1 foot per 1,000 years during the past 600,000 years. The structural axis, located 3 to 6 miles east of the western valley margin, has remained stationary during the late Quaternary period and governs the general location and orientation of the valley. The topographic axis (trough) of the valley, approximated by the interface of Sierran alluvium and Coast Ranges alluvium on the valley floor, has rarely coincided with the structural axis, suggesting that rates of sedimentation have equaled or exceeded rates of subsidence [Lettis, 1982].

4.2.2 Local Geology

The site is in an area classified as having surficial deposits consisting of older alluvium of Quaternary age [Page & LeBlanc, 1969; Figure 2]. Alluvial, lacustrine, playa, and fluvial deposits underlie the site and are described as unconsolidated and semi-consolidated. One of the more regionally significant units is the Pleistocene Corcoran Clay Member (E-Clay) of the Tulare Formation [Ireland et al., 1984]; the eastern extent of this unit is estimated to be about 20 miles southwest of the site [Page, 1986]. There are no rock outcrops at the site. The depth to the basement complex of consolidated rocks is approximately 1,200 feet [Page & LeBlanc, 1969; also see figures titled Geologic Cross Section D-D' and Geologic Map of the Fresno Area in Appendix B].

The site is located approximately 11 miles southwestwest of the nearest known ultramafic rock outcropping [CDMG, 2000a]. However, there are no rock outcrops at the site.

The surface soils at the site are mapped as Ramona Loam, 0 to 2 percent slopes (http://websoilsurvey.nrcs.usda.gov). A U.S Department of Agriculture, Natural Resources Conservation Service figure depicting the soil types mapped at the site is included in Appendix B, along with a description of the soil types.

4.2.3 Plate Tectonic Setting

The boundary between the North American and Pacific tectonic plates lies approximately 75 miles southwest of the site. The site is located on the North American tectonic plate, which is separated from the Pacific tectonic plate by the San Andreas fault. The relative motion between these two plates has been estimated from paleomagnetic lineations in the Gulf of California, from global solutions to known slip rates along plate boundaries, from geology, and from geodesy to be primarily horizontal at a rate of about 50 millimeters a year [Minster and Jordan, 1978; DeMets et al., 1987; Wallace, 1990]. On a broad scale, the North American-Pacific tectonic plate boundary in California is a transform fault that extends from the Gulf of California to Cape Mendocino. The San Andreas fault and the transform plate boundary end to the north at the Mendocino Triple Junction in northernmost California. North of Cape Mendocino, the spreading center and subduction zone of the Juan de Fuca plate lie between the North American and Pacific tectonic plates. At the southern end, another spreading center lies in the Gulf of California, creating parts of the Pacific and Rivera tectonic plates. The transform faults of that spreading center merge into the San Andreas fault system near the Imperial Valley and the Salton Sea [Hutton et al., 1991].

4.2.4 Faults and Seismicity

Most of Fresno County is situated within an area of relatively low seismic activity. Faults and fault systems that lie near the eastern and western boundaries of the County, as well as other regional faults, have the potential to produce high-magnitude earthquakes. High magnitude earthquakes on these faults could cause moderate intensity groundshaking in the County [Fresno County, 2000].

The only Quaternary fault located within about 62 miles (100 kilometers) of the site is the Nunez fault zone northwest of Coalinga. An "active fault" is defined by the CGS as one that has had surface displacement within the last 11,000 years (CGS, 2000b). Faults with no evidence of surface displacement within the last 11,000 years (i.e., Holocene age) are not necessarily inactive. Potentially active faults have shown displacement within the last 1.6 million years (Quaternary age). "Inactive faults" show no evidence of movement in historic or recent geologic time, suggesting that the faults are dormant, although they could resume activity again. [Fresno County, 2000]. Figure 3 presents a regional fault map. Significant Quaternary faults are summarized below:

Ortigalita Fault Zone

The Ortigalita fault zone is approximately 50-miles long, originating near Crow Creek in western Stanislaus County and extending southeast to a few miles north of Panoche in western Fresno County. Most of the fault is considered active due to displacement during Holocene time [Fresno County, 2000; Jennings and Bryant, 2010]. The Ortagalita fault zone is designated an Earthquake Fault Zone by CGS [CGS, 2000b]

The Ortigalita fault zone is a major Holocene dextral strike-slip fault in the central Coast Ranges that is an eastern part of the larger San Andreas Fault System. The fault zone is about 69 miles from the site at its closest point. The Ortigalita fault zone is characterized by echelon fault traces separated by pull-apart basins. The fault zone is divided into four sections. The Little Panoche Valley section is the southernmost section and is closest to the site. The Little Panoche Valley section is late-Holocene active. Late Quaternary slip rates and recurrence intervals are unknown, although the recurrence interval for the entire Ortigalita fault zone is about 2,000 to 5,000 years. The vertical slip rate is at least 0.01-0.04 millimeters per year. The dextral slip component is probably greater than the vertical component and is estimated to be 0.5 to 1.5 millimeters per year [USGS, 2006a].

San Andreas Fault Zone

The San Andreas fault zone lies to the west and southwest of the site. The fault is considered active by the State of California [Jennings and Bryant, 2010] and is of primary concern in evaluating seismic hazards throughout western Fresno County [Fresno County 2000]. The 684-mile-long San Andreas fault zone is the principal element of the San Andreas fault system, a network of faults with predominantly dextral strike-slip displacement that collectively accommodates the majority of relative north-south motion between the North American and Pacific plates. The San Andreas fault zone is the most extensively studied fault in California and perhaps the world. The creeping section of the San Andreas fault is about 75 miles from the site at its closest point. The San Andreas fault zone is considered to be a late-Holocene-active dextral strike-slip fault that extends along most of coastal California from its complex junction with the Mendocino fault zone on the north, southeast to the northern Transverse Range, and inland to the Salton Sea, where a well-defined zone of seismicity transfers the slip to the Imperial fault along a right-releasing stepover [USGS, 2006b]. The San Andreas fault zone is designated an Earthquake Fault Zone by CGS [CGS, 2000b].

Two major surface-rupturing earthquakes have occurred on the San Andreas fault in historic time: the 1857 Fort Tejon and 1906 San Francisco earthquakes. Additional historic surface rupturing earthquakes include the unnamed 1812 earthquake along the Mojave section and northern part of the San Bernardino Mountains section, and a large earthquake in the San Francisco Bay area that occurred in 1838 that was probably on the Peninsula section. Historic fault creep rates are as high as 32 millimeters per year for the 82-mile-long creeping section in central California with creep rates gradually tapering to zero at the northwestern and southeastern ends of the section. Average slip rates for the San Andreas fault zone exceed 5.0 millimeters per year [USGS, 2006b].

Nunez Fault

The Nunez fault is located approximately 6 to 7 miles northwest of Coalinga and is about 60 miles from the site at its closest point. The fault is about 2.6 miles long and is considered active based on surface rupture associated with the 1983 Coalinga earthquake [Jennings and Bryant, 2010]. The fault is divided into two north and south trending segments. About 2.1 miles of right-reverse surface rupture occurred on the segments. Total displacement and timing of past fault movements are poorly constrained [Rymer and Ellsworth, 1990; Fresno County, 2000]. The Nunez fault is designated an Earthquake Fault Zone by CGS [CGS, 2000b].

Clovis Fault

The northwest-trending Clovis fault is believed to be located approximately five to six miles east of the City of Clovis, extending from an area just south of the San Joaquin River to a few miles south of Fancher Creek. The fault is about 5.5 miles from the site at its closest point. The Clovis fault is considered a pre-Quaternary fault with no recognized Quaternary displacement [Jennings and Bryant, 2010]. The fault is not necessarily inactive [Fresno County, 2000]. The Clovis fault is not designated an Earthquake Fault Zone by CGS [CGS, 2000b].

Foothills Fault System

The southern part of the Foothills fault system includes the Bear Mountains fault zone and the Melones fault zone, as well as numerous smaller, but related faults. The fault system is about 53 miles north-northwest of the site at its closest point. According to CGS data, portions of these fault systems are considered to be Quaternary or late Quaternary active faults, though these portions are greater than 75 miles northwest of the site [Jennings and Bryant, 2010]. Geologic investigations of the seismic safety of the Auburn Dam site suggest that these faults are potentially active. Therefore, the possibility exists that earthquakes could occur on these faults [Fresno County, 2000]. The Foothills fault zone is not designated an Earthquake Fault Zone by CGS [CGS, 2000b].

Great Valley Thrust Faults

The Great Valley thrust faults have been divided into at least 14 segments extending over 300 miles in cumulative length based on geomorphic interpretation of the range front bordering the western edge of the Central Valley [USGS, 2006b]. The Great Valley thrust faults' locations are poorly constrained. The closest Great Valley thrust fault is about 54 miles from the site at its closest point. Recent evidence suggests that the faults located along the western boundary of the San Joaquin Valley may be more active than once believed. Asymmetrical folds identified on the eastern slopes of the Coast Ranges can hide faults that show no surface rupture. The faults and folds along the Coast Range-Sierran Block Boundary (Great Valley thrust faults) are similar to or include the faults and folds that were the source of the 1983 Coalinga earthquake. The Great Valley thrust faults are now believed to be active and capable of generating large magnitude earthquakes [Rymer and Ellsworth, 1990; Fresno County, 2000]. The Great Valley thrust faults are not designated as Earthquake Fault Zones by CGS [CGS, 2000b].

4.3 HYDROLOGY

Mill Ditch, on the southern boundary of the site, is the closest surface water body to the site. Red Bank Slough, at its closest point, is located approximately 1.5 miles east of the site at its confluence with Mill Ditch. Fancher Creek, at its closest point, is located approximately 1.5 miles south of the site. The Kings River is located approximately 11 miles southeast of the site. Except for irrigation canals and small, man-made basins, there are no other surface water bodies within several miles of the site.

The site is located within the Kings Subbasin of the San Joaquin Valley groundwater basin [DWR, 1980]. Groundwater occurs in an unconfined/semiconfined aquifer in unconsolidated alluvium [Page & LeBlanc, 1969]. Review of groundwater data collected by the California Department of Water Resources (DWR) for a water well located approximately 600 feet north of the site shows that the depth to groundwater declined from approximately 34 feet below ground surface (bgs) in the 1970s to 85 feet bgs in 2018 (www.casgem.water.ca.gov). A map of the well location and a hydrograph presenting historical groundwater level data are provided in Appendix B.

Review of the groundwater elevation contour map for Fall 2017 (the most recent available data) available using the DWR online Groundwater Information Center Interactive Map Application (gis.water.ca.gov/app/gicima) indicates that the groundwater elevation beneath the site was approximately 255 feet amsl, which corresponds to a depth to groundwater of approximately 80 feet bgs. The DWR contour map indicates that the groundwater flow direction at the subject property was toward the west in Fall 2017. The groundwater flow direction may vary based on many factors, including regional recharge conditions and nearby groundwater extraction wells. The actual groundwater flow direction and depth in the vicinity of the subject property cannot be assessed without site-specific groundwater monitoring well data.

5.0 ENGINEERING GEOLOGY AND SEISMOLOGY FINDINGS

The following sections describe potential geologic hazards at the site. The potential occurrence of each hazard has been qualitatively classified as negligible, low, moderate or high.

5.1 SURFACE RUPTURE

The Alquist-Priolo Earthquake Fault Zoning Act stipulates that no structure for human occupancy may be constructed within an Earthquake Fault Zone designated by CGS until a site-specific evaluation of surface fault rupture and fault creep has been performed. These zones are established by the CGS along faults or segments of faults that are judged to be sufficiently active and well defined as to constitute a potential hazard to structures from surface faulting or fault creep.

The site is not located within an Earthquake Fault Zone. The nearest Earthquake Fault Zone is the Nunez fault, which is about 60 miles from the site at its closest point. No active faults were identified within approximately 4.5 miles of the site [Bartow 1991; Fresno County 2000]. Considering this distance and the lack of observed historical faulting in the site vicinity, AECOM judges the potential for fault rupture at the site to be negligible.

5.2 GROUND SHAKING

Although the site is situated within an area of relatively low seismic activity [Fresno County, 2000], moderate ground shaking is considered possible at the site. However, it should be noted that this would be true for any potential school site within the CUSD boundaries.

The estimated peak horizontal ground acceleration as a fraction of acceleration due to gravity (g) based on a 10 percent probability of being exceeded in 50 years is between 0.10g and 0.15g at the site [USGS, 2014]. Estimated peak horizontal ground acceleration based on a 2 percent probability of being exceeded in 50 years is between 0.20g and 0.30g at the site [USGS, 2014]. See respective figures titled USGS Seismic-Hazard Maps in Appendix B. Estimated ground motions based on interpolated values may not equal values calculated for a specific site, and should be considered preliminary.

5.3 LIQUEFACTION AND SEISMIC SETTLEMENT

Liquefaction is a phenomenon whereby loose, saturated, granular soils lose their inherent shear strength due to excess pore water pressure build-up such as that generated during repeated cyclic loading from an earthquake. A low relative density of the granular materials, shallow groundwater table (generally less than 50 feet bgs), long duration, and high acceleration of seismic shaking are some of the factors associated with liquefaction. The presence of predominantly cohesive or fine-grained materials and/or absence of saturated conditions can preclude liquefaction. Liquefaction hazards are usually manifested during seismic events in the form of buoyancy forces, increase in lateral earth pressures, and horizontal and vertical movements resulting from lateral spreading, and post-earthquake settlement of the liquefied materials.

Ground accelerations must approach 0.3g before liquefaction occurs in a sandy soil with relative densities typical of Kings River alluvial deposits [Fresno County, 2000]. The depth to groundwater in the site vicinity has steadily declined from about 34 feet bgs in the 1970s to about 80 feet bgs or greater currently. While depth to groundwater is possibly less than 50 feet, the moderate ground shaking potential at the site makes liquefaction unlikely.

Seismic settlement can occur in poorly consolidated soils during ground shaking. During settlement, the soil materials are physically rearranged by the shaking to result in a less stable alignment of the individual minerals. Settlement of sufficient magnitude to cause significant structural damage is normally associated with rapidly deposited alluvial soils, or improperly founded or poorly compacted fill. These areas are known to undergo extensive settling with the addition of irrigation water. Based on the soil type mapped at the site (Section 4.2.2), the risk of seismic settlement is considered negligible.

5.4 EXPANSIVE SOILS

Expansive soils greatly increase in volume when they absorb water and shrink when they dry out. Expansion is measured by shrink-swell potential, which is relative volume change in soil with a gain in moisture. Expansive soils may damage buildings, roads, and other structures built on them. The site is not located within an area of soils known to have moderately high-to-high expansion potential (see figure titled Expansive Soils in Appendix B). Furthermore, the soil type mapped at the site does not appear likely to present an expansive soil hazard (Section 4.2.2). Therefore, the risk of expansive soils at the site is considered negligible to low.

5.5 LANDSLIDES AND SLOPE STABILITY

The CGS has not developed landslide hazard maps for Fresno County. There is virtually no risk of large landslides in most of the valley area due to its relatively flat topography (see figure titled Landslide Hazards and Areas of Subsidence in Appendix B). There is potential for small slides and slumping along the steep banks of rivers or creeks [Fresno County, 2000].

The existing topography at the site does not provide sufficient relief to cause concern due to potential landslides. There are no topographic features of significant relief that could present a landslide hazard to the facility within several miles of the site.

5.6 SUBSIDENCE OR HYDROCOLLAPSE

Subsidence occurs when a large portion of land is displaced vertically, usually due to the withdrawal of groundwater, oil, or natural gas. Soils that are particularly susceptible to subsidence include those with high silt or clay contents. Subsidence caused by groundwater withdrawal can affect large areas [Fresno County, 2000].

About one-half of the San Joaquin Valley has been affected by subsidence [Poland, et al., 1975]. Most of the subsiding area in the San Joaquin Valley is underlain by a continuous and extensive confining bed, and most of the pumping overdraft and compaction due to head decline occurs in the confined aquifer system beneath this bed. North of Wasco, the confining bed is the Pleistocene Corcoran Clay Member (E-Clay) of the Tulare Formation [Ireland, et al., 1984]; these deposits are located about 20 miles southwest of the site [Page, 1986]. The site is located in an area with little or no subsidence [Poland, et al., 1975, Ireland, et al., 1984, Ireland, 1986; also see figure titled Landslide Hazards and Areas of Subsidence in Appendix B].

5.7 FLOODING OR DAM INUNDATION

The eastern portion of Fresno County is drained primarily by the San Joaquin and Kings rivers. The drainage of the site is toward the southwest and consists of overland sheet flow. The topography slopes to the southwest at less than 1 percent grade [USGS, 1978]. The site is ultimately drained by the Kings River into the Sacramento River delta or inland basins to the south. Major flooding is not expected at the site, but sheet overland flow and pooling in low areas is probable during heavy or prolonged storms.

Most of the site is located within the 500-year floodplain (Zone X, areas determined to be outside the 0.2% annual chance floodplain), but outside the 100-year floodplain, as shown on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), which is provided in Appendix B (see also figure titled 100 Year Flood Inundation Areas in Appendix B). The floodplain boundaries are delineated by FEMA on the basis of hydrology, topography, and modeling of flow during predicted rainstorms. The analysis of predicted flooding does not account for the effects of continued land subsidence or increases in sea level [Fresno County, 2000].

According to DWR records, there are 33 dams located within Fresno County [Fresno County, 2000]. Of these, four major dams could cause substantial flooding in Fresno County in the event of a failure: Friant Dam, Big Dry Creek Dam, Redbank-Fancher Creek Project Dams, and Pine Flat Dam. Failure of these dams is considered a very unlikely event. The site is located outside the flood inundation areas in the event of failure of these dams (see the figure titled Dam Failure Flood Inundation Areas in Appendix B).

5.8 TSUNAMIS OR SEICHES

A tsunami is a large, transient long-period sea wave caused by submarine landslides, earthquakes, or volcanic eruptions. Based on the site's distance from the ocean, tsunami hazards at the site are not considered possible.

Seiches are standing waves produced in a body of water such as a reservoir, lake, or harbor by wind, atmospheric changes, or earthquakes. No large bodies of water have been identified within approximately 15 miles of the site. Therefore, seiche hazards at the site are not considered possible.

5.9 VOLCANOES

The Mono Lake-Long Valley area is the closest known active volcanic region to the site. This area is located approximately 80 miles northeast of the site. Lava, tephra (ejected materials such as dust, ash, and cinder transported through the air), and pyroclastic (rock fragment) flows often occur during large volcanic events. With increased distance from a volcano, there is decreased risk of impacts. Should a volcanic eruption occur, it is likely that a significant amount of ash would be released into the atmosphere. The likelihood that ash would affect the site depends on the frequency with which winds at various heights above the volcano blow toward the area [Fresno County, 2000]. Historic wind directions and wind speeds suggest that most volcanic ash from Mono Lake-Long Valley area eruptions would be deposited to the east of the volcano or volcanic vents.

In the event of an eruption, the site could conceivably be subject to the deposition of volcanic ash. However, it should be noted that the risk would be essentially equal at any potential school site within the CUSD boundaries.

6.0 ENVIRONMENTAL HAZARDS FINDINGS

AECOM conducted surveys for hazardous pipelines, electrical power lines, air toxics sources, aboveground storage tanks, and railroad tracks at the site and out to the respective radii from the site boundaries that are established for these various potential hazards in the California Education Code and/or in CDE regulations or guidance documents.

6.1 HAZARDOUS PIPELINE SURVEY

AECOM contacted the State Fire Marshal (SFM), the local natural-gas service provider (Pacific Gas and Electric Company [PG&E]), and Fresno Irrigation District (FID) regarding whether hazardous pipelines or high-volume water supply pipelines, as defined by CDE, are located within 1,500 feet of the site (see documentation in Appendix C). AECOM also reviewed maps of oil/gas/geothermal fields prepared by the California Division of Oil, Gas & Geothermal Resources (DOGGR), and conducted a field survey for pipeline markers visible at or from the site or from road rights-of-way within 1,500 feet of the site. AECOM found that:

- There are no pipelines jurisdictional to the SFM within 1,500 feet of the site.
- PG&E has no natural gas transmission pipelines within 1,500 feet of the site.
- FID knows of one irrigation water pipeline likely of 12-inches or greater in diameter that is within 1,500 feet of the site:
    - FID's Temperance No. 37 pipeline runs south from Mill Ditch along the west side of Fowler Avenue. Based on the vicinity topography, it does not appear that leakage from this pipeline is likely to cause significant flooding at the site.
- The site is not mapped as being within an oil, gas or geothermal field, so there was no need to contact DOGGR regarding potential pipelines.
- No pipeline markers were observed within 1,500 feet of the site.

6.2 ELECTRICAL POWERLINE SURVEY

AECOM contacted the local electrical service provider (PG&E) regarding whether overhead electrical powerlines rated for greater than 50 kilovolts (kv) are located within 350 feet of the site (see documentation in Appendix C). AECOM also conducted a field survey for such powerlines visible at or from the site or from road rights-of-way within 350 feet of the site. AECOM found that:

- There are no PG&E overhead electrical transmission powerlines rated for greater than 50 kv within 350 feet of the site. The powerlines mentioned in the PG&E communication are more than 500 feet east of the site.
- No electrical powerlines were observed within 350 feet of the site, other than distribution powerlines, which are typically rated at 21 kv or less.

6.3 AIR TOXICS SURVEY

AECOM contacted the Fresno County Environmental Health Division (FCEHD) and the San Joaquin Valley Air Pollution Control District (SJVAPCD) regarding whether there are facilities that may produce hazardous air emissions and/or handle hazardous materials within ¼ mile of the site (see documentation in Appendix C). AECOM also conducted a field survey for such facilities within ¼ mile of the site that are visible at or from the site or from road rights-of-way. AECOM found that:

- The FCEHD found no such facilities located within ¼ mile of the site.
- The SJVAPCD reported no permitted facilities located within ¼ mile of the site.

6.4 ABOVEGROUND STORAGE TANKS SURVEY

AECOM contacted FID regarding whether there are aboveground fuel or water storage tanks located within ¼ mile of the site (see documentation in Appendix C). AECOM also reviewed a 2016 aerial photograph and conducted a field survey for such storage tanks visible at or from the site or from road rights-of-way within ¼ mile of the site. AECOM found that:

- FID has no such storage tanks within ¼ mile of the site.
- Aboveground propane tanks are likely present at rural residences that are within ¼ mile of the site. The nearest propane tank appears to be at a house located more than 400 feet north of the site.

6.5 RAILROAD TRACKS SURVEY

AECOM reviewed a 2014 aerial photograph and a 1981 USGS topographic map and conducted a field survey for railroad tracks located within 1,500 feet of the site. AECOM found that railroad tracks were mapped previously immediately south of Mill Ditch, but the railroad tracks are no longer present.

7.0 SUMMARY AND RECOMMENDATIONS

The only geologic hazards identified as having a more than insignificant risk level for the site are: 1) moderate ground shaking during an earthquake, 2) most of the site is located within the 500-year floodplain, but outside the 100-year floodplain, as delineated by FEMA, and 3) deposition of volcanic ash in the event of volcanic eruption in the Mono Lake-Long Valley area. It should be noted that the first and third of these geologic hazards would affect any potential school site within the CUSD boundaries. Based on the data reviewed, the soils present at the site do not appear to present a significant hazard of liquefaction, seismic settlement, or expansion.

Potentially significant environmental hazards identified for the site are:

- Aboveground propane tanks are likely present at rural residences within ¼ mile of the site (Section 6.4). The nearest propane tank appears to be at a house located more than 400 feet north of the site.

AECOM recommends the following:

- Prior to construction of the planned facility, a full geotechnical engineering investigation, including on-site borings and testing of soil samples, should be conducted by a California-registered Geotechnical Engineer. Also, an engineering geology and seismology study should be conducted in accordance with CGS Note 48.
- If necessary, design of the school facilities should take into consideration the site's location within the 500-year floodplain.
- In accordance with the "School Site Selection and Approval Guide" prepared by the School Facilities Planning Division of the California Department of Education, CUSD should contact the following agencies for assistance in evaluating safety issues associated with the nearby propane tanks identified in Section 6.4:
    - California State Fire Marshal;
    - California Public Utilities Commission, Natural Gas Safety Branch;
    - California Department of Industrial Relations; and
    - Local Fire Marshal.

8.0 LIMITATIONS

This document was prepared by AECOM for the sole use of Client. This document was prepared in a manner consistent with the level of care and skill ordinarily exercised by professional engineers, geologists, and environmental scientists engaged in similar projects in the geographic area of the site. AECOM provides no other warranties, either express or implied, concerning the contents of this document, which was prepared under the technical direction of the registered professional(s) who signed the cover letter.

9.0 REFERENCES

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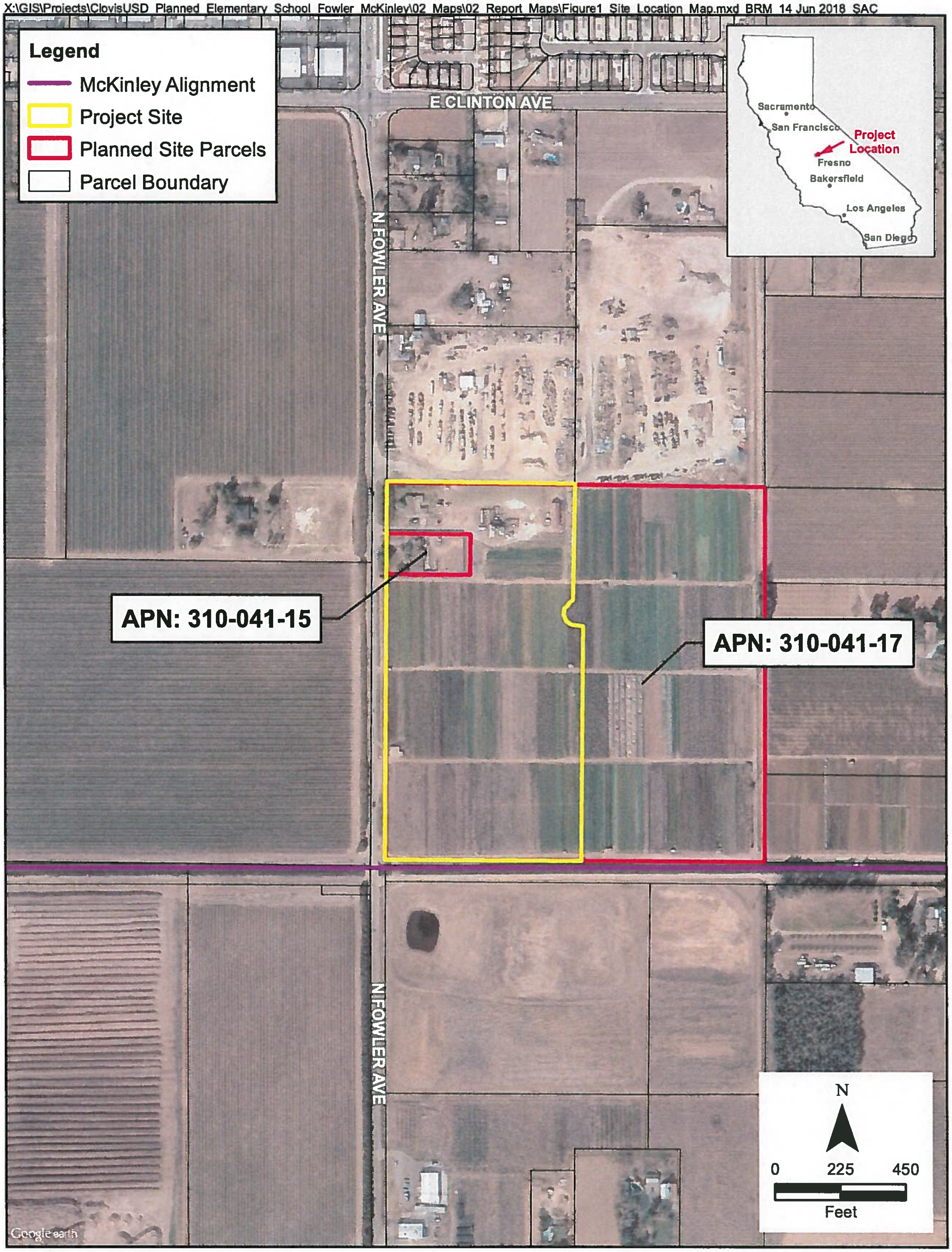


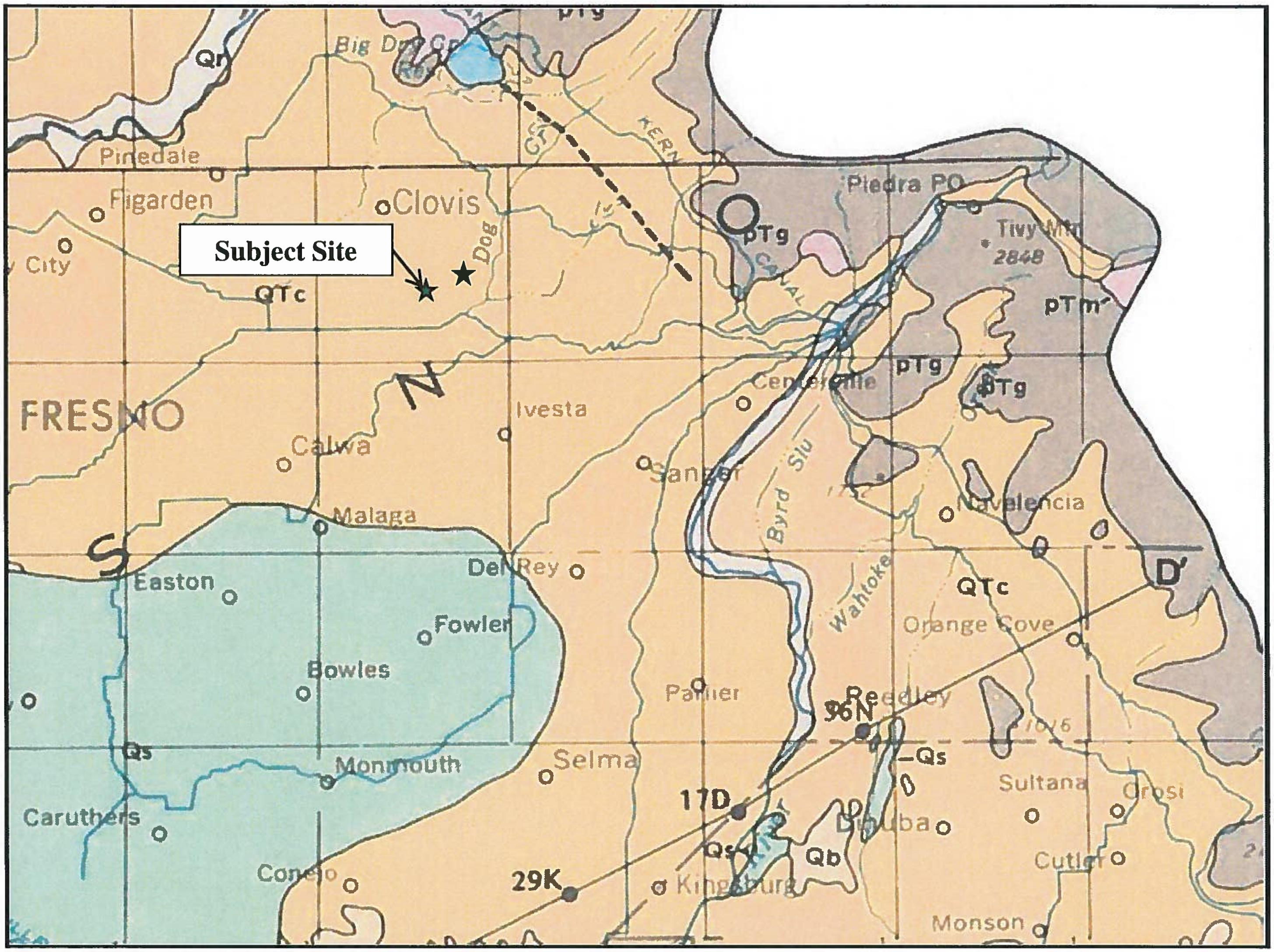
Aerial Photo: February 2018

Site Location Map

Planned Elementary School Site
Northeast of Fowler & McKinley Avenues
Fresno County, CA

AECOM

Figure 1



DESCRIPTION OF MAP UNITS

- **Qs** — **Sand dunes (Holocene)** Windblown sand and dune sand
- **Qb** — **Flood-basin deposits (Holocene)** Clay, silt, and some sand; near Stockton consist of muck, peat, and other organic soils. In places may include part of the Modesto Formation (Pleistocene)
- **Qr** — **River deposits (Holocene)** Gravel, sand, silt, and minor amounts of clay; deposited along channels, flood plains, and natural levees of main streams. In places may include part of Modesto Formation (Pleistocene)
- **QTl** — **Lacustrine and marsh deposits (Pliocene to Holocene)** Clay, silt, and some sand; in subsurface include three widespread clays: A clay (Pleistocene and Holocene?); C clay (Pleistocene); and modified E clay (Pleistocene), includes Corcoran Clay Member of Tulare and Turlock Lake Formations
- **QTc** — **Continental rocks and deposits (Miocene to Holocene)** Heterogeneous mix of generally poorly sorted clay, silt, sand, and gravel; some beds of claystone, siltstone, sandstone, and conglomerate. Include some informal units: younger alluvium (Holocene), older alluvium (Pleistocene and Holocene?) and continental deposits (Pliocene and Pleistocene); three formations of Pleistocene age: Modesto, Riverbank, and Turlock Lake; Tulare Formation (Pliocene and Pleistocene) on western side of valley, Laguna Formation (Pliocene) on eastern side, and Kern River Formation (Miocene to Pleistocene?) on southeastern part
- **pTg** — **Granitic rocks (Pre-Tertiary)** Chiefly granitic rocks on eastern side of valley, in places consists of mafic intrusive rocks

N

0' 25,000'

- **Contact** Approximately located
- **Fault** Dashed where approximately located, dotted where concealed
- **D — D'** Line of geologic section
- **● 34A** Well and number

Source: Geologic Map of the San Joaquin Valley, California (Page, 1986)

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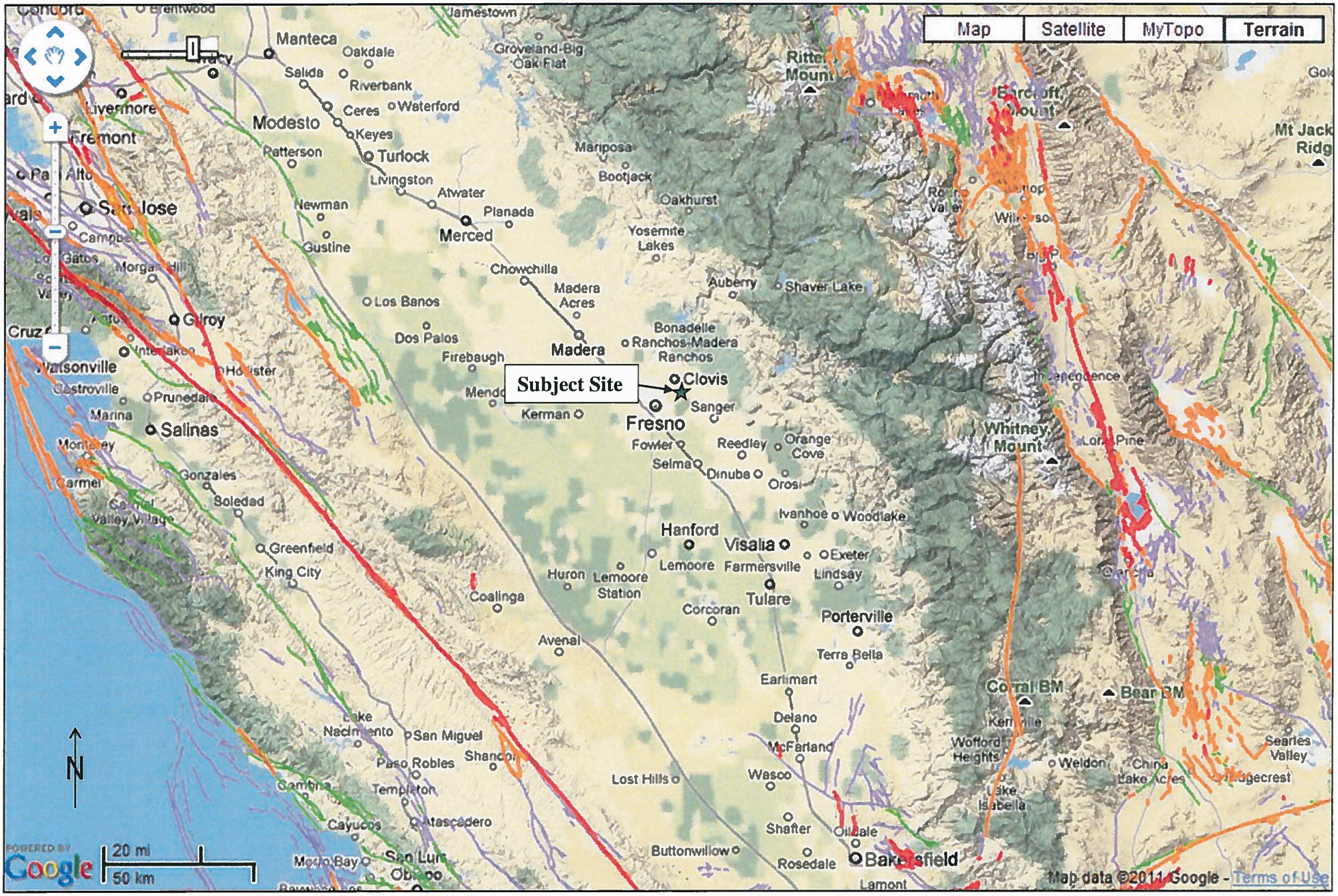
Regional Geology Map
Planned Fowler-McKinley Elementary School
Fresno County, CA

Figure 2



Note: see Figure 3B titled Regional Fault Map Explanation

AECOM

Source: Jennings and Bryant (2010)

Regional Fault Map
Planned Fowler-McKinley Elementary School
Fresno County, CA

Figure 3A

EXPLANATION

Fault traces on land are indicated by solid lines where well located, by dashed lines where approximately located or inferred, and by dotted lines where concealed by younger rocks or by lakes or bays. Fault traces are queried where continuation or existence is uncertain. Concealed faults in the Great Valley are based on maps of selected subsurface horizons, so locations shown are approximate and may indicate structural trend only. All offshore faults based on seismic reflection profile records are shown as solid lines where well defined, dashed where inferred, queried where uncertain.

FAULT CLASSIFICATION COLOR CODE
(Indicating Recency of Movement)

Fault along which historic (last 200 years) displacement has occurred and is associated with one or more of the following:

(a) a recorded earthquake with surface rupture. (Also included are some well-defined surface breaks caused by ground shaking during earthquakes, e.g. extensive ground breakage, not on the White Wolf fault, caused by the Arvin-Tehachapi earthquake of 1952). The date of the associated earthquake is indicated. Where repeated surface ruptures on the same fault have occurred, only the date of the latest movement may be indicated, especially if earlier reports are not well documented as to location of ground breaks.

(b) fault creep slippage - slow ground displacement usually without accompanying earthquakes.

(c) displaced survey lines.

A triangle to the right or left of the date indicates termination point of observed surface displacement. Solid red triangle indicates known location of rupture termination point. Open black triangle indicates uncertain or estimated location of rupture termination point.

Date bracketed by triangles indicates local fault break.

No triangle by date indicates an intermediate point along fault break.

Fault that exhibits fault creep slippage. Hachures indicate linear extent of fault creep. Annotation (creep with leader) indicates representative locations where fault creep has been observed and recorded.

Square on fault indicates where fault creep slippage has occured that has been triggered by an earthquake on some other fault. Date of causative earthquake indicated. Squares to right and left of date indicate terminal points between which triggered creep slippage has occurred (creep either continuous or intermittent between these end points).

Holocene fault displacement (during past 11,700 years) without historic record. Geomorphic evidence for Holocene faulting includes sag ponds, scarps showing little erosion, or the following features in Holocene age deposits: offset stream courses, linear scarps, shutter ridges, and triangular faceted spurs. Recency of faulting offshore is based on the interpreted age of the youngest strata displaced by faulting.

Late Quaternary fault displacement (during past 700,000 years). Geomorphic evidence similar to that described for Holocene faults except features are less distinct. Faulting may be younger, but lack of younger overlying deposits precludes more accurate age classification.

Quaternary fault (age undifferentiated). Most faults of this category show evidence of displacement sometime during the past 1.6 million years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age. Unnumbered Quaternary faults were based on Fault Map of California, 1975. See Bulletin 201, Appendix D for source data.

Pre-Quaternary fault (older that 1.6 million years) or fault without recognized Quaternary displacement. Some faults are shown in this category because the source of mapping used was of reconnaissance nature, or was not done with the object of dating fault displacements. Faults in this category are not necessarily inactive.

ADDITIONAL FAULT SYMBOLS

Bar and ball on downthrown side (relative or apparent).

Arrows along fault indicate relative or apparent direction of lateral movement.

Arrow on fault indicates direction of dip.

Low angle fault (barbs on upper plate). Fault surface generally dips less than 45° but locally may have been subsequently steepened. On offshore faults, barbs simply indicate a reverse fault regardless of steepness of dip.

OTHER SYMBOLS

Numbers refer to annotations listed in the appendices of the accompanying report. Annotations include fault name, age of fault displacement, and pertinent references including Earthquake Fault Zone maps where a fault has been zoned by the Alquist-Priolo Earthquake Fault Zoning Act. This Act requires the State Geologist to delineate zones to encompass faults with Holocene displacement.

Structural discontinuity (offshore) separating differing Neogene structural domains. May indicate discontinuities between basement rocks.

Brawley Seismic Zone, a linear zone of seismicity locally up to 10 km wide associated with the releasing step between the Imperial and San Andreas faults.

Geologic Time Scale			Years Before Present (Approx.)	Fault Symbol	Recency of Movement	DESCRIPTION: ON LAND	DESCRIPTION: OFFSHORE
Quaternary*	Late Quaternary	Historic	0–200			Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.	
Quaternary*	Late Quaternary	Holocene	200–11,700			Displacement during Holocene time.	Fault offsets seafloor sediments or strata of Holocene age.
Quaternary*	Late Quaternary	Pleistocene	11,700–700,000			Faults showing evidence of displacement during late Quaternary time.	Fault cuts strata of Late Pleistocene age.
Quaternary*	Early Quaternary	Pleistocene	700,000–1,600,000			Undivided Quaternary faults - most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age.	Fault cuts strata of Quaternary age.
Pre-Quaternary			1,600,000–4.5 billion (Age of Earth)			Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive.	Fault cuts strata of Pliocene or older age.

* Quaternary now recognized as extending to 2.6 Ma (Walker and Geissman, 2009). Quaternary faults in this map were established using the previous 1.6 Ma criterion.

AECOM

Source: Jennings and Bryant (2010)

Regional Fault Map Explanation
Planned Fowler-McKinley Elementary School
Fresno County, CA

Figure 3B

APPENDIX A

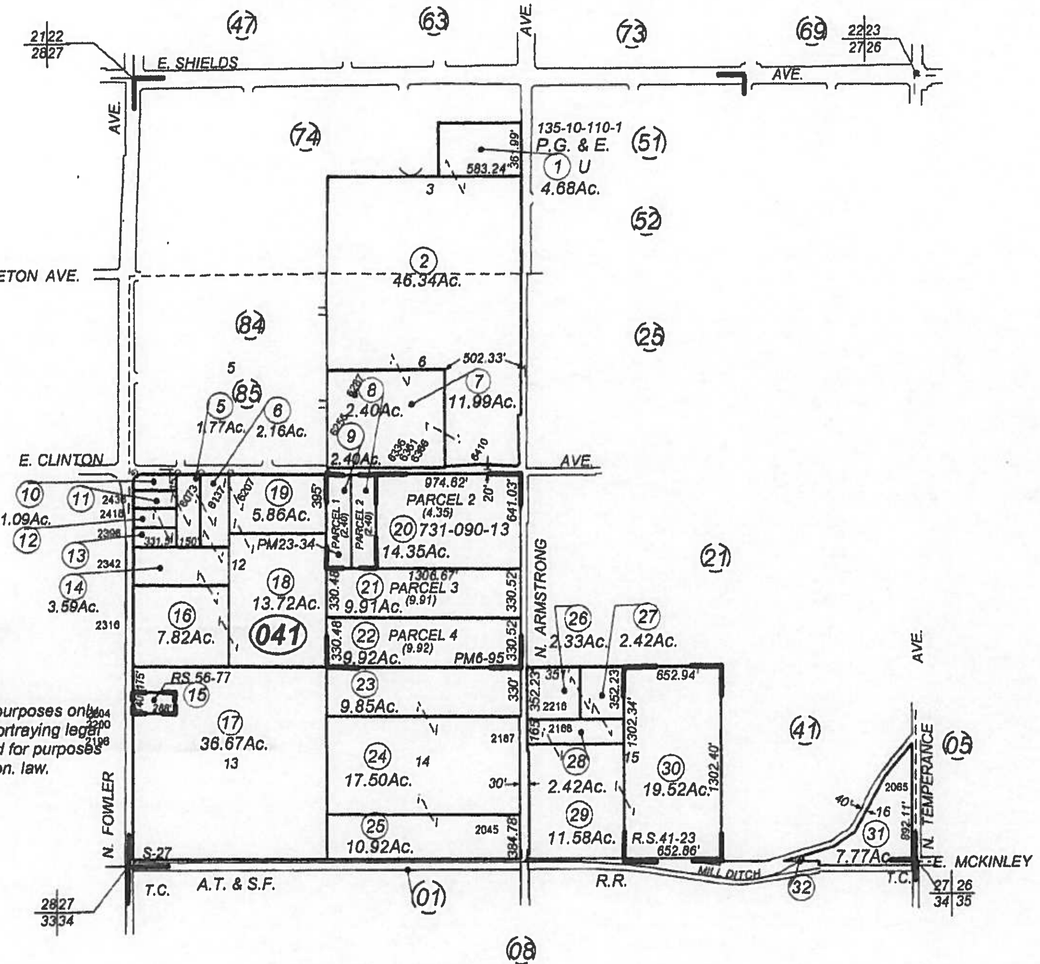
ASSESSOR'S MAP

SUBDIVIDED LAND IN SEC. 27, T.13S., R.21E., M.D.B. & M.

Tax Rate Area
5-346 76-052
5-347

310-04

1"=800'



-NOTE-
This map is for Assessment purposes only.
It is not to be construed as portraying legal ownership or divisions of land for purposes of zoning or subdivision. law.

Agricultural Preserve
Parcel Map No. 1329 - Bk. 6, Pg. 95
Parcel Map No. 3429 - Bk. 23, Pg. 34
Record of Survey - Bk. 56, Pg. 77
Record of Survey - Bk. 41, Pg. 23
Subdivision of Sec. 27, T.13S., R.21E., M.D.B. & M. - Plat Bk. 5, Pg. 14
Temperance Colony - Plat Bk. 2, Pg. 7

5/15/2017

Note - Assessor's Block Numbers Shown in Ellipses
Assessor's Parcel Numbers Shown in Circles

Assessor's Map Bk.310 - Pg.04
County of Fresno, Calif.

APPENDIX B

REFERENCE FIGURES

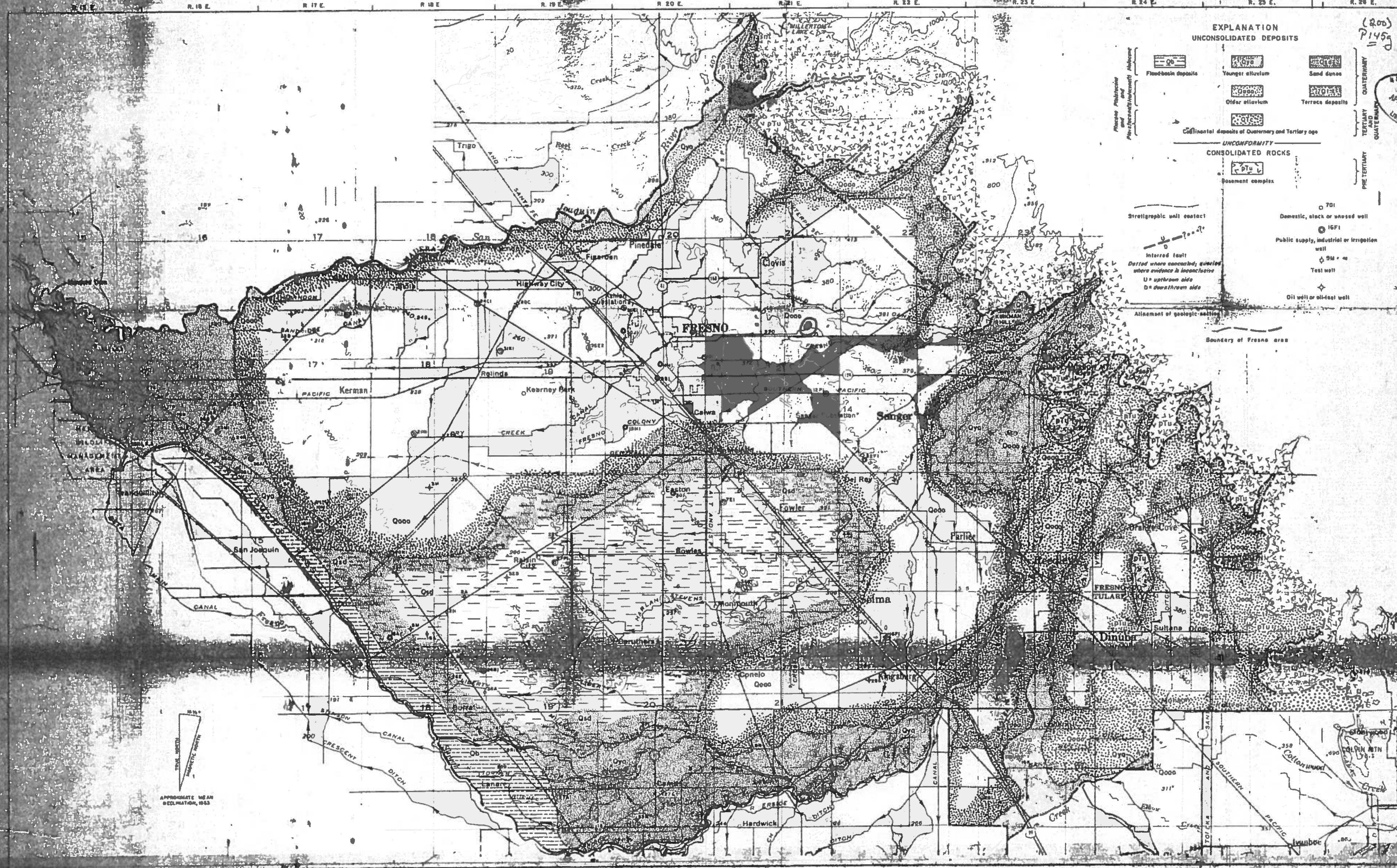


FIGURE 7.–GEOLOGIC MAP OF THE FRESNO AREA, SAN JOAQUIN VALLEY, CALIFORNIA

U.S. GEOLOGICAL SURVEY

Prepared in cooperation with CALIFORNIA DEPARTMENT OF WATER RESOURCES

FIGURE 5

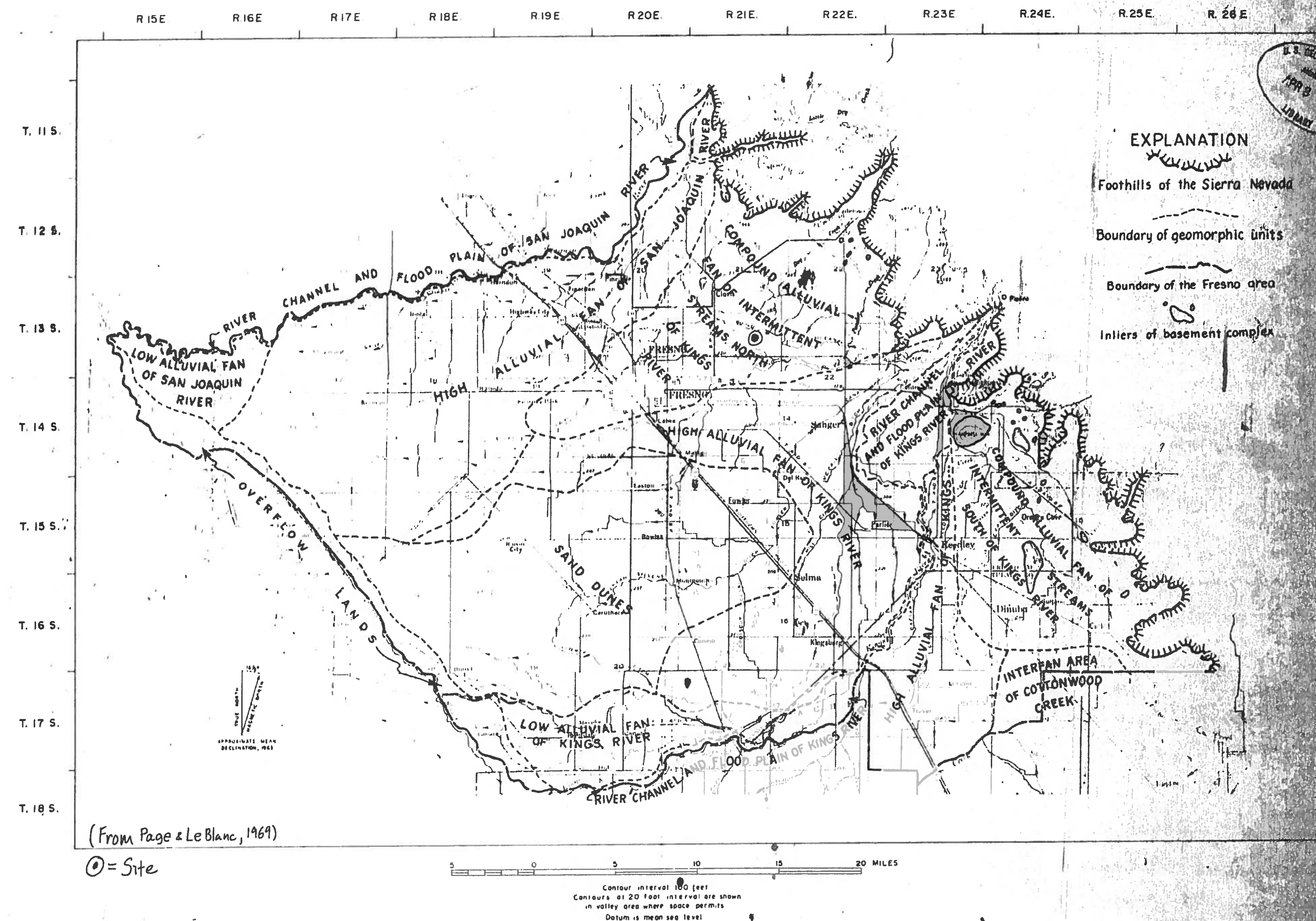


FIGURE 5.– MAP SHOWING GEOMORPHIC FEATURES OF THE FRESNO AREA, SAN JOAQUIN VALLEY, CALIFORNIA

U.S. GEOLOGICAL SURVEY

Prepared in cooperation with CALIFORNIA DEPARTMENT OF WATER RESOURCES

FIGURE 8

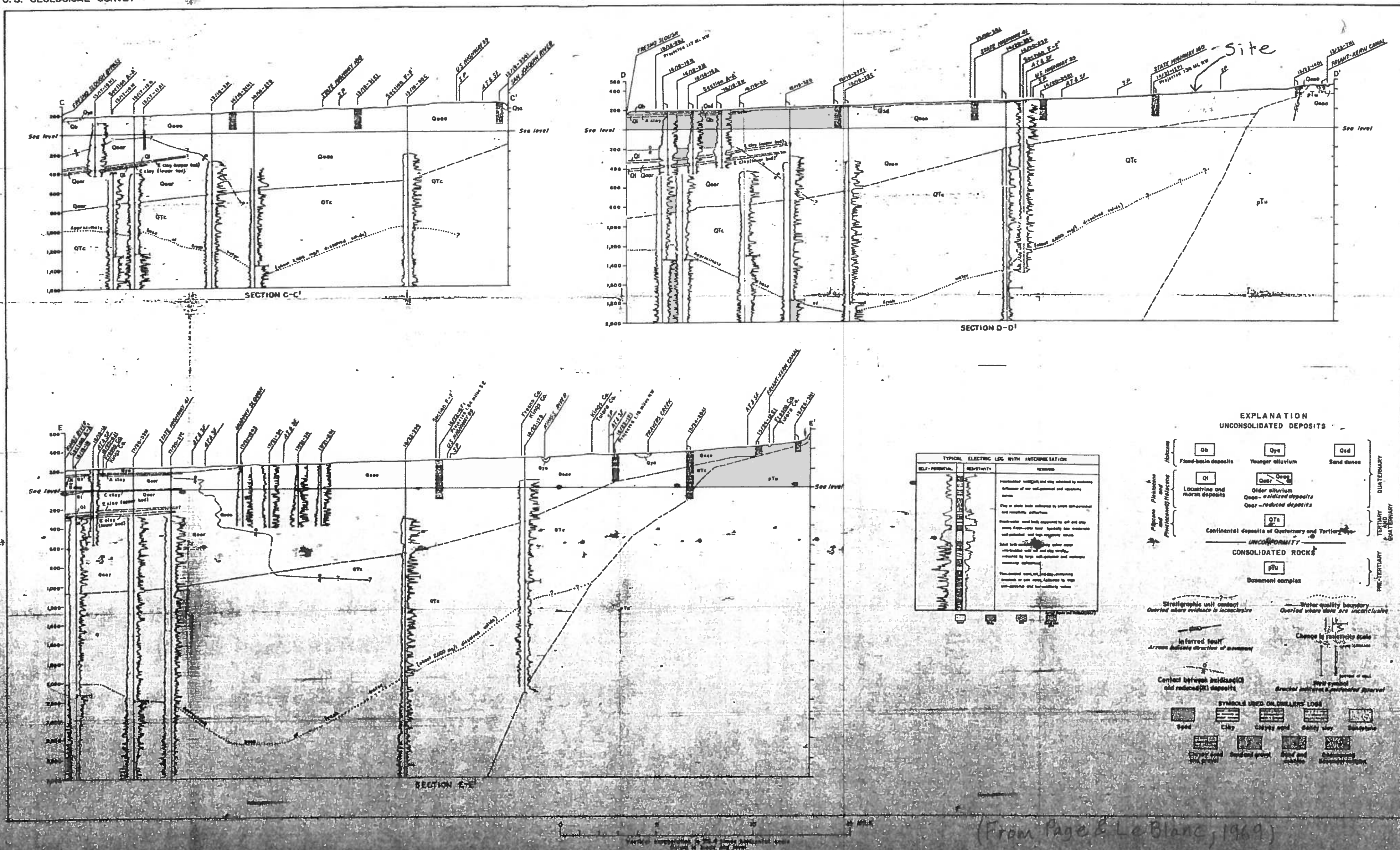


FIGURE 8.—GEOLOGIC CROSS SECTIONS C-C', D-D', AND E-E', FRESNO AREA, SAN JOAQUIN VALLEY, CALIFORNIA

Soil Map—Eastern Fresno Area, California

Map Scale: 1:5,880 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 250, 500, 1000, 1500

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: Eastern Fresno Area, California
Survey Area Data: Version 10, Oct 4, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 26, 2017—May 21, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
ArA	Atwater sandy loam, 0 to 3 percent slopes	0.6	0.4%
GtA	Greenfield sandy loam, 0 to 3 percent slopes	0.6	0.4%
Ra	Ramona sandy loam	5.7	3.9%
Rc	Ramona loam	137.8	94.5%
Re	Ramona loam, hard substratum	1.0	0.7%
Totals for Area of Interest		**145.7**	**100.0%**

Eastern Fresno Area, California

Rc—Ramona loam

Map Unit Setting

National map unit symbol: hl8m
Elevation: 250 to 500 feet
Mean annual precipitation: 9 to 15 inches
Mean annual air temperature: 60 to 62 degrees F
Frost-free period: 225 to 275 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Ramona and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ramona

Setting

Landform: Alluvial fans, stream terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

A - 0 to 12 inches: loam
BAt - 12 to 24 inches: loam
Bt - 24 to 38 inches: clay loam
C - 38 to 60 inches: coarse sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Unnamed, fine sandy loam

Percent of map unit: 10 percent
Landform: Alluvial fans, stream terraces
Hydric soil rating: No

Unnamed, gently sloping

Percent of map unit: 5 percent
Landform: Alluvial fans, stream terraces
Hydric soil rating: No

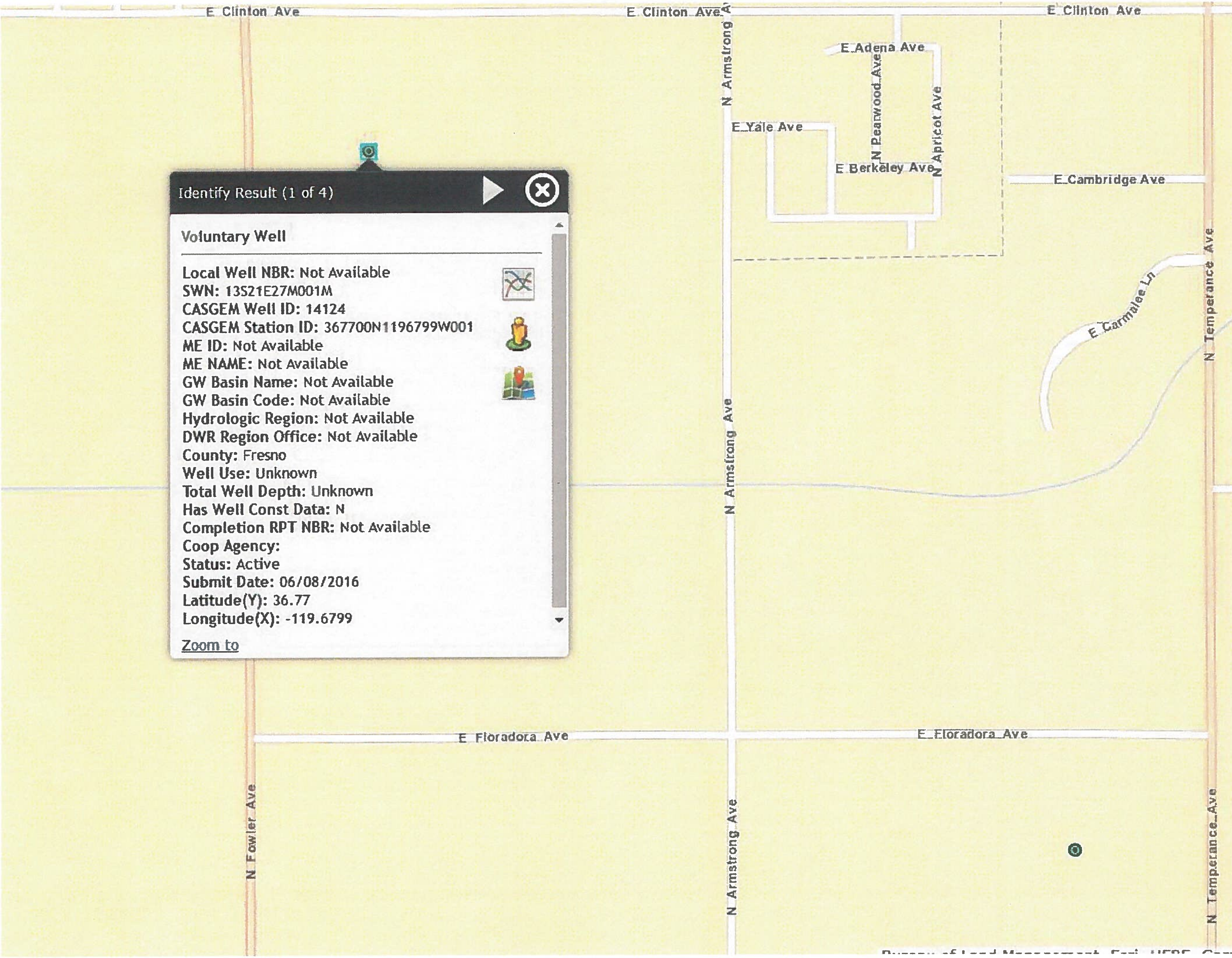
Unnamed, clay loam

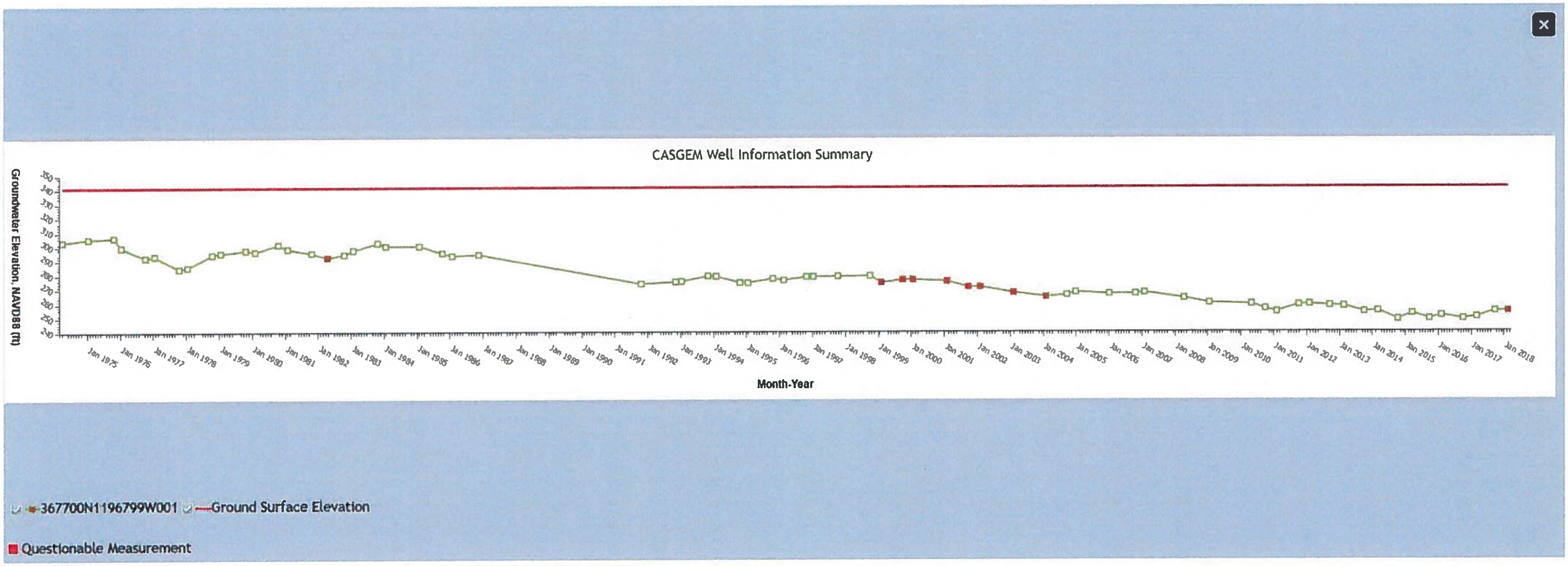
Percent of map unit: 5 percent
Landform: Alluvial fans, stream terraces
Hydric soil rating: No

Data Source Information

Soil Survey Area: Eastern Fresno Area, California
Survey Area Data: Version 10, Oct 4, 2017

N Temperance Ave
N Temperance Ave
E Clinton Ave
E Cambridge Ave
E Carmalee Ln
N Apricot Ave
E Adena Ave
N Pearwood Ave
E Berkeley Ave
E Yale Ave
E Floradora Ave
N Armstrong Ave
N Armstrong Ave
N Armstrong Ave
E Clinton Ave
E Floradora Ave
E Clinton Ave
N Fowler Ave
N Fowler Ave


E Clinton Ave
E Clinton Ave
E Clinton Ave
N Armstrong Ave
E Adena Ave
N Pearwood Ave
N Apricot Ave
E Yale Ave
E Berkeley Ave
E Cambridge Ave
E Carmalee Ln
N Temperance Ave
Identify Result (1 of 4)
Voluntary Well
Local Well NBR: Not Available
SWN: 13S21E27M001M
CASGEM Well ID: 14124
CASGEM Station ID: 367700N1196799W001
ME ID: Not Available
ME NAME: Not Available
GW Basin Name: Not Available
GW Basin Code: Not Available
Hydrologic Region: Not Available
DWR Region Office: Not Available
County: Fresno
Well Use: Unknown
Total Well Depth: Unknown
Has Well Const Data: N
Completion RPT NBR: Not Available
Coop Agency:
Status: Active
Submit Date: 06/08/2016
Latitude(Y): 36.77
Longitude(X): -119.6799
Zoom to
N Armstrong Ave
E Floradora Ave
E Floradora Ave
N Fowler Ave
N Armstrong Ave
N Temperance Ave


CASGEM Well Information Summary
Groundwater Elevation, NAVD88 (ft)
350
340
330
320
310
300
290
280
270
260
250
240
Jan 1975
Jan 1976
Jan 1977
Jan 1978
Jan 1979
Jan 1980
Jan 1981
Jan 1982
Jan 1983
Jan 1984
Jan 1985
Jan 1986
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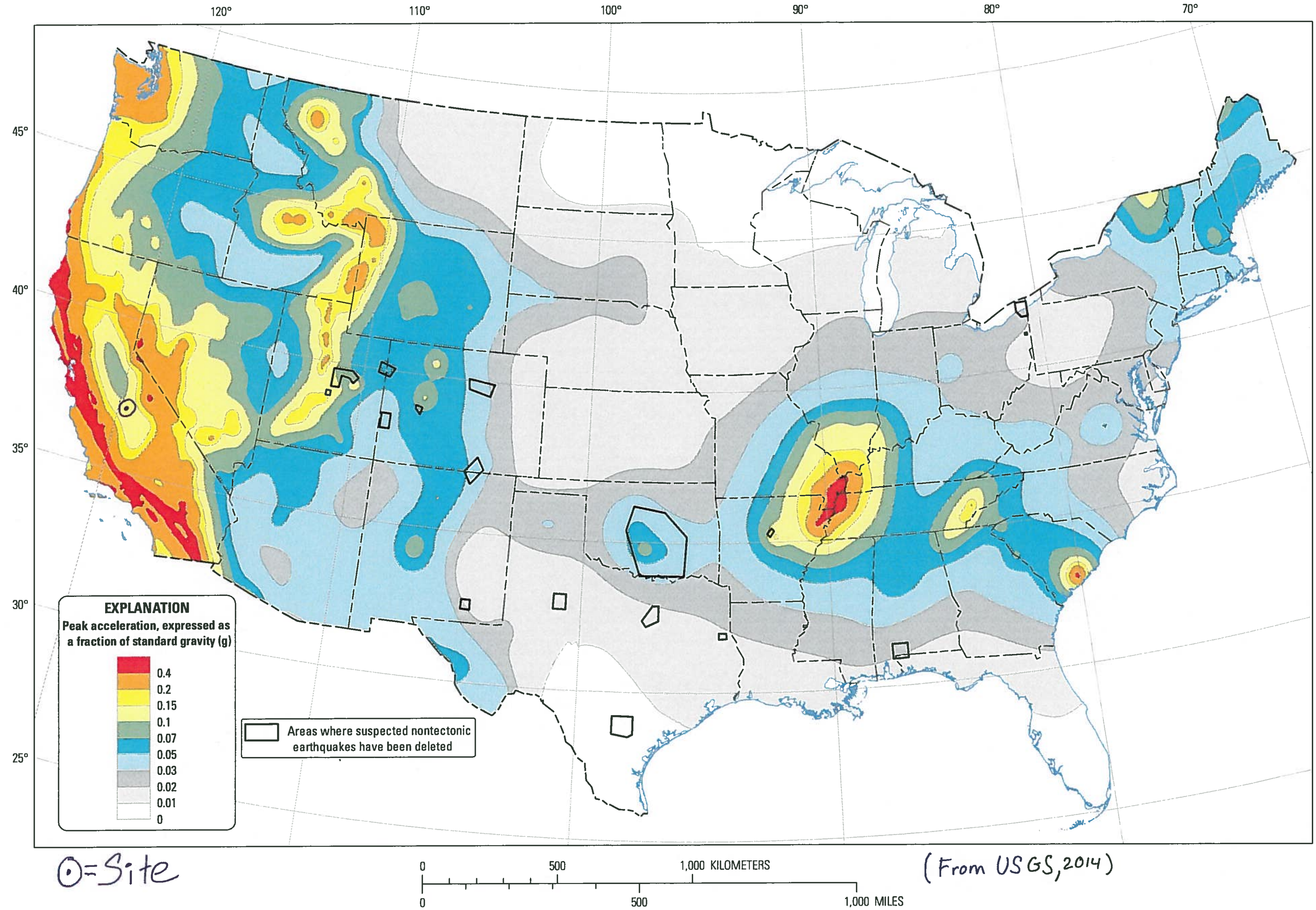
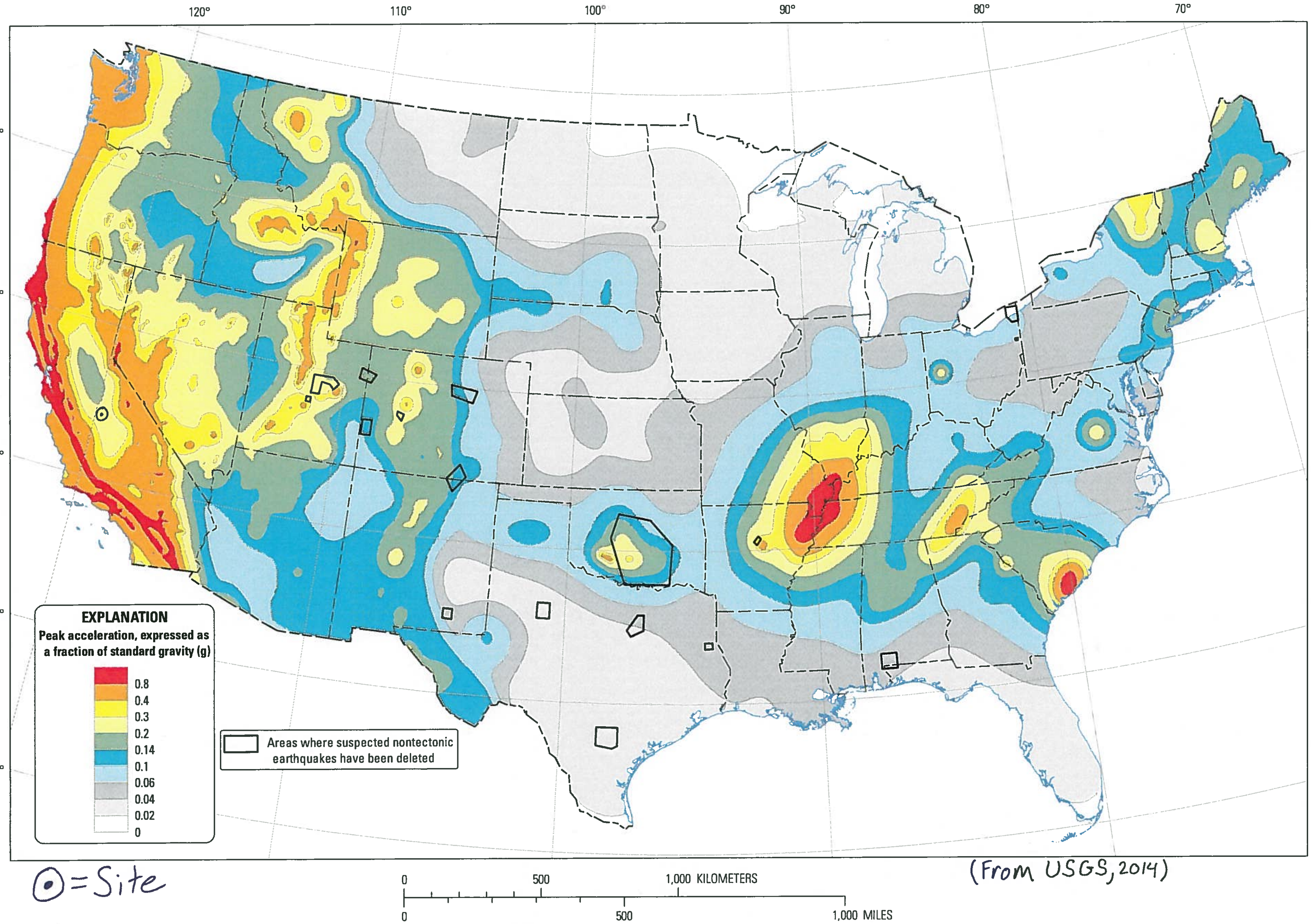
Jan 2005
Jan 2006
Jan 2007
Jan 2008
Jan 2009
Jan 2010
Jan 2011
Jan 2012
Jan 2013
Jan 2014
Jan 2015
Jan 2016
Jan 2017
Jan 2018
Month-Year
367700N1196799W001
Ground Surface Elevation
Questionable Measurement



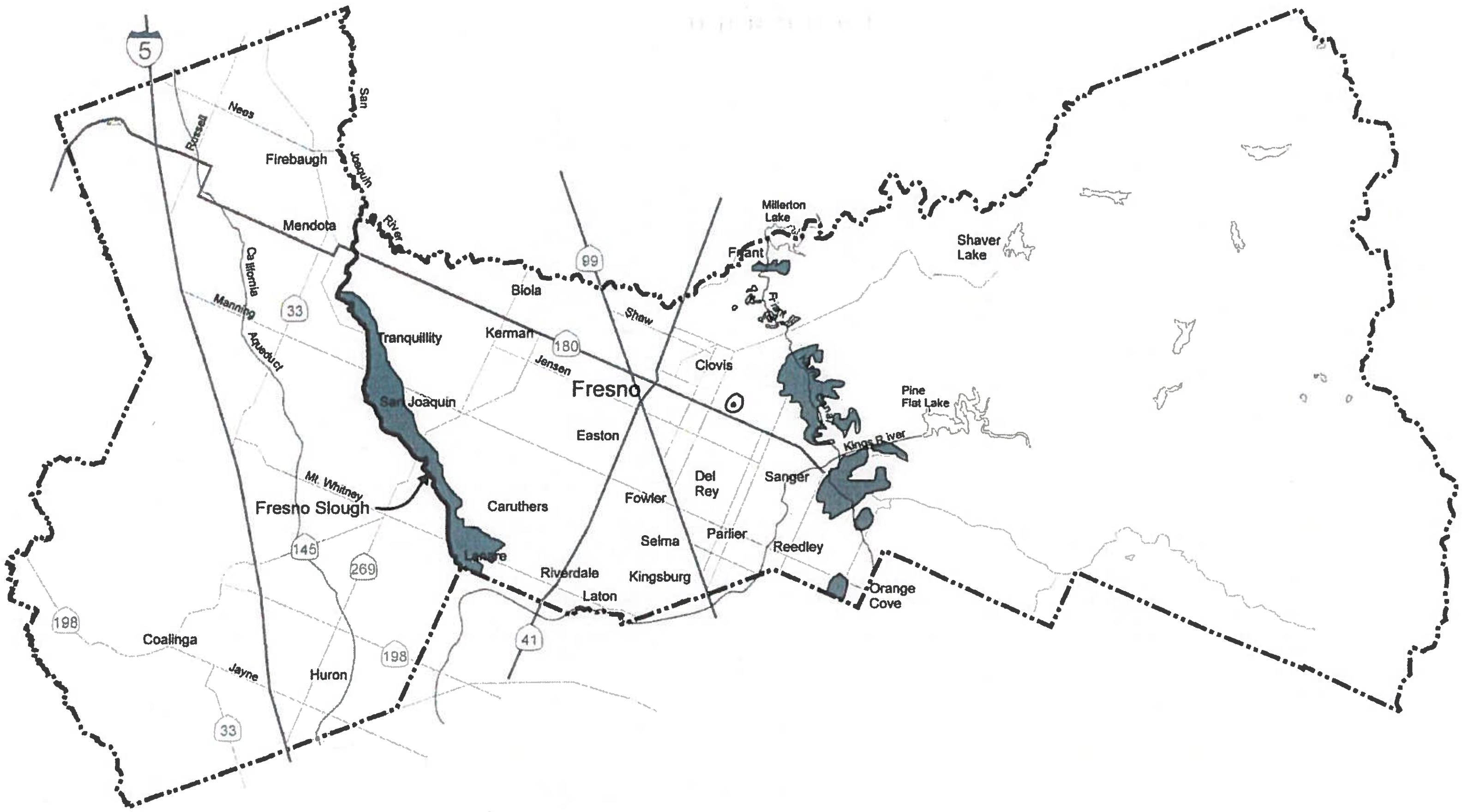
⊙=Site

(From USGS, 2014)

Ten-percent probability of exceedance in 50 years map of peak ground acceleration



Two-percent probability of exceedance in 50 years map of peak ground acceleration



Soils Exhibiting Moderately High to High Expansion Potential (Generalized Locations)

Fresno County General Plan

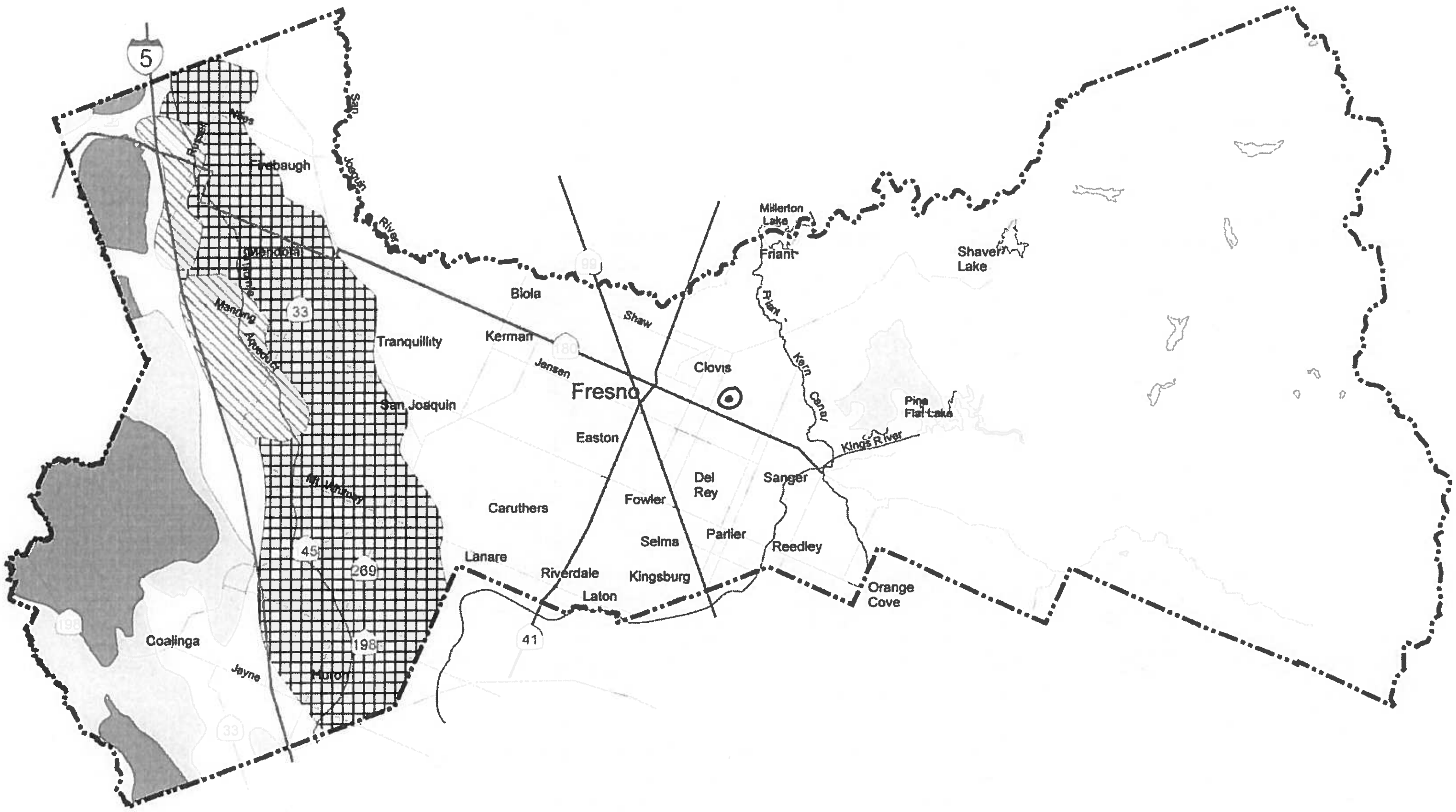
Expansive Soils

Figure 7-1

Source: U.S. Department of Agriculture Soil Conservation Service

⊙ = Site

(From Fresno County, 2000)



NORTH 0 — 10 1" = 10 miles	Moderate Landslide Hazard Deep Subsidence	High Landslide Hazard Shallow Subsidence	Fresno County General Plan **Landslide Hazards and Areas of Subsidence** **Figure 9-6**

Source: Fresno County Regional Open Space Plan, 1972

⊙ = Site

(From Fresno County, 2000)

NOTES TO USERS

p is for use in administering the National Flood Insurance Program. It , necessarily identify all areas subject to flooding, particularly from local sources of small size. The community map repository should be d for possible updated or additional flood hazard information.

n more detailed information in areas where Base Flood Elevations and/or floodways have been determined, users are encouraged to consult d Profiles and Floodway Data and/or Summary of Stillwater Elevations ntained within the Flood Insurance Study (FIS) report that accompanies M. Users should be aware that BFEs shown on the FIRM represent whole-foot elevations. These BFEs are intended for flood insurance urposes only and should not be used as the sole source of flood information. Accordingly, flood elevation data presented in the FIS hould be utilized in conjunction with the FIRM for purposes of tion and/or floodplain management.

l Base Flood Elevations shown on this map apply only landward of h American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should e that coastal flood elevations are also provided in the Summary of Elevations tables in the Flood Insurance Study report for this jurisdiction. as shown in the Summary of Stillwater Elevations tables should be used for tion and/or floodplain management purposes when they are higher than tions shown on this FIRM.

ies of the floodways were computed at cross sections and interpolated cross sections. The floodways were based on hydraulic considerations ard to requirements of the National Flood Insurance Program. Floodway nd other pertinent floodway data are provided in the Flood Insurance port for this jurisdiction.

reas not in Special Flood Hazard Areas may be protected by flood structures. Refer to Section 2.4 "Flood Protection Measures" of the surance Study report for information on flood control structures for this n.

jection used in the preparation of this map was California State Plane (FIPS 404). The horizontal datum was NAD 83, GRS80 spheroid. es in datum, spheroid, projection or State Plane zones used in the n of FIRMs for adjacent jurisdictions may result in slight positional es in map features across jurisdiction boundaries. These differences do t the accuracy of this FIRM.

vations on this map are referenced to the North American Vertical Datum These flood elevations must be compared to structure and ground e referenced to the same vertical datum. For information regarding on between the National Geodetic Vertical Datum of 1929 and the merican Vertical Datum of 1988, visit the National Geodetic Survey at http://www.ngs.noaa.gov or contact the National Geodetic Survey at ving address:

rmation Services
/NGS12
Geodetic Survey
, #9202
st-West Highway
ring, Maryland 20910-3282
3-3242

e current elevation, description, and/or location information for bench shown on this map, please contact the Information Services Branch National Geodetic Survey at (301) 713-3242, or visit its website at w.ngs.noaa.gov.

ap transportation information shown on this FIRM was provided in digital om Fresno County. Public Land Survey System information was derived . Geological Survey Digital Orthophoto Quadrangles produced at a scale 00 from photography dated 1997 or later.

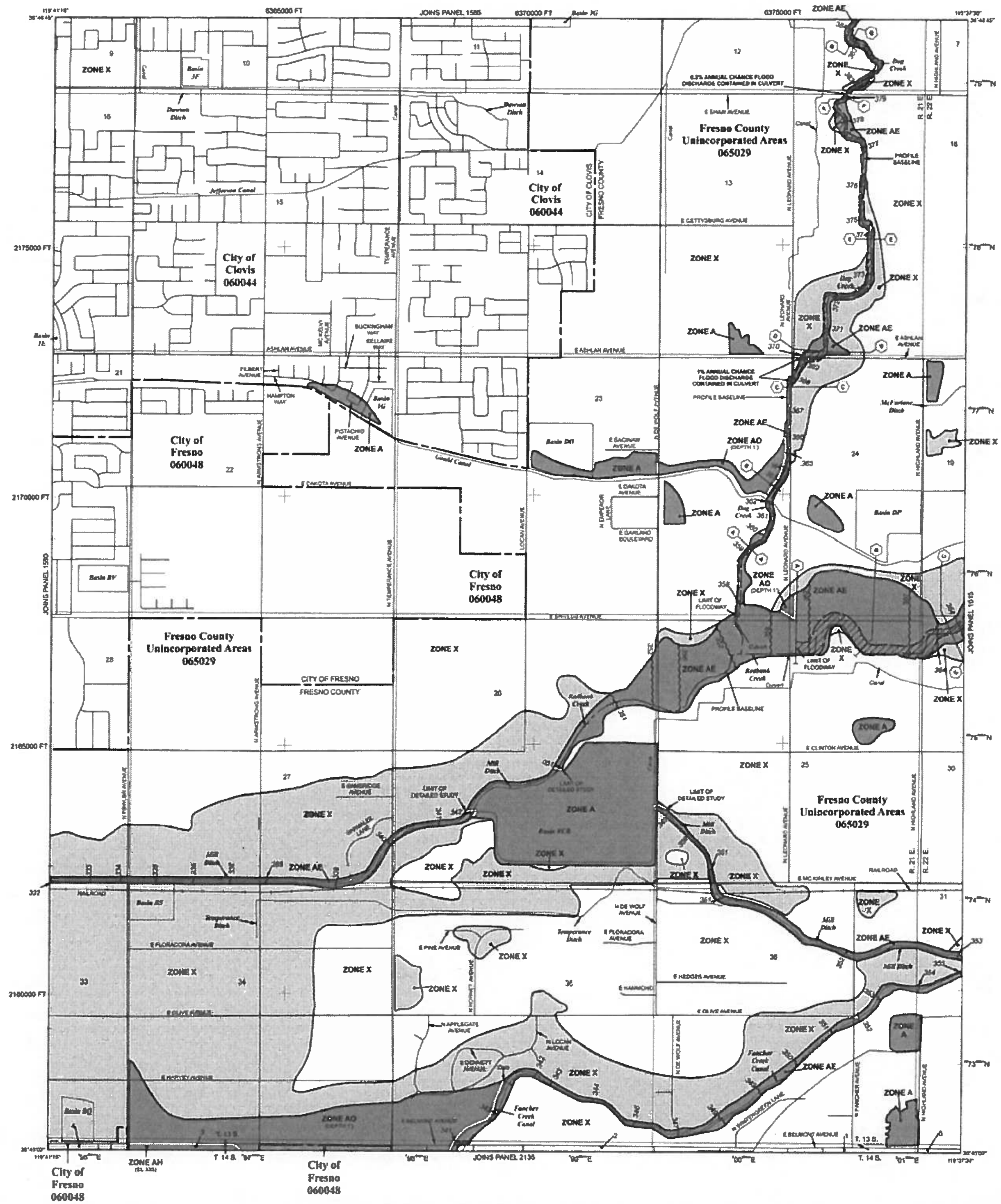
p reflects more detailed and up-to-date stream channel configurations se shown on the previous FIRM for this jurisdiction. The floodplains and s that were transferred from the previous FIRM may have been adjusted m to these new stream channel configurations. As a result, the Flood and Floodway Data tables in the Flood Insurance Study Report (which authoritative hydraulic data) may reflect stream channel distances that n what is shown on this map.

te limits shown on this map are based on the best data available at the ublication. Because changes due to annexations or de-annexations may curred after this map was published, map users should contact appropriate ity officials to verify current corporate limit locations.

efer to the separately printed Map Index for an overview map of the howing the layout of map panels, community map repository addresses, sting of Communities table containing National Flood Insurance Program each community as well as a listing of the panels on which each ity is located.

the FEMA Map Service Center at 1-800-358-9616 for information on products associated with this FIRM. Available products may include ly issued Letters of Map Change, a Flood Insurance Study report, and/or ersions of this map. The FEMA Map Service Center may also be reached 1-800-358-9620 and its website at http://msc.fema.gov.

ve questions about this map or questions concerning the National Flood e Program in general, please call 1-877-FEMA MAP (1-877-336-2627) or FEMA website at http://www.fema.gov.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUND[ATION] BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood th[at has a] 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Ar[ea is the] area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard [include] Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water[-surface] elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Bas[e Flood] Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); [average] depths determined. For areas of alluvial fan flooding, velocit[ies also] determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annua[l chance] flood by a flood control system that was subsequently decertified. [Zone AR] indicates that the former flood control system is being restored to [provide] protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Fede[ral flood] protection system under construction; no Base Flood E[levations] determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Bas[e Flood] Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Bas[e Flood] Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be k[ept free] of encroachment so that the 1% annual chance flood can be carried without substantial i[ncreases] in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance fl[ood with] average depths of less than 1 foot or with drainage areas le[ss than] 1 square mile; and areas protected by levees from 1% annual chanc[e flood].

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Are[as].

	Floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas and boundary dividing Special Flood Hazard Areas of differ[ent] Base Flood Elevations, flood depths or flood velocities.
~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; e[levation] in feet*

* Referenced to the North American Vertical Datum of 1988

(A)—(A)	Cross section line
(23)- - -(23)	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North Am[erican] Datum of 1983 (NAD 83), Western Hemisphere
$^{42}76^{000m}$N	1000-meter Universal Transverse Mercator grid values, z[one] 10
600000 FT	5000-foot grid ticks: California State Plane coordinate system, zone IV (FIPSZONE 0404), Lambert Conformal C[onic] projection
DX5510 x	Bench mark (see explanation in Notes to Users section o[f this] FIRM panel)
•M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
July 19, 2001

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
February 18, 2009 – to update corporate limits, to change base flood elevations, floodway and Special Flood Hazard Areas, to add roads and road names and to incorporate previously issued Letters of Map Revision

For community map revision history prior to countywide mapping, refer to the Comm[unity] Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Ins[urance] agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1595H

FIRM
FLOOD INSURANCE RATE

FRESNO COUNTY,
CALIFORNIA
AND INCORPORATED AREAS

PANEL 1595 OF 3525
(SEE MAP INDEX FOR FIRM PANEL LA

CONTAINS:

COMMUNITY	NUMBER	PANEL
CLOVIS, CITY OF	060044	1595
FRESNO COUNTY	065029	1595
FRESNO, CITY OF	060048	1595

Notice to User: The Map Number shown belo[w should be] used when placing map orders; the Communi[ty Number] shown above should be used on insurance applic[ations for the] subject community.

MAP NU[MBER]
06019C

MAP RE[VISED]
FEBRUARY 1

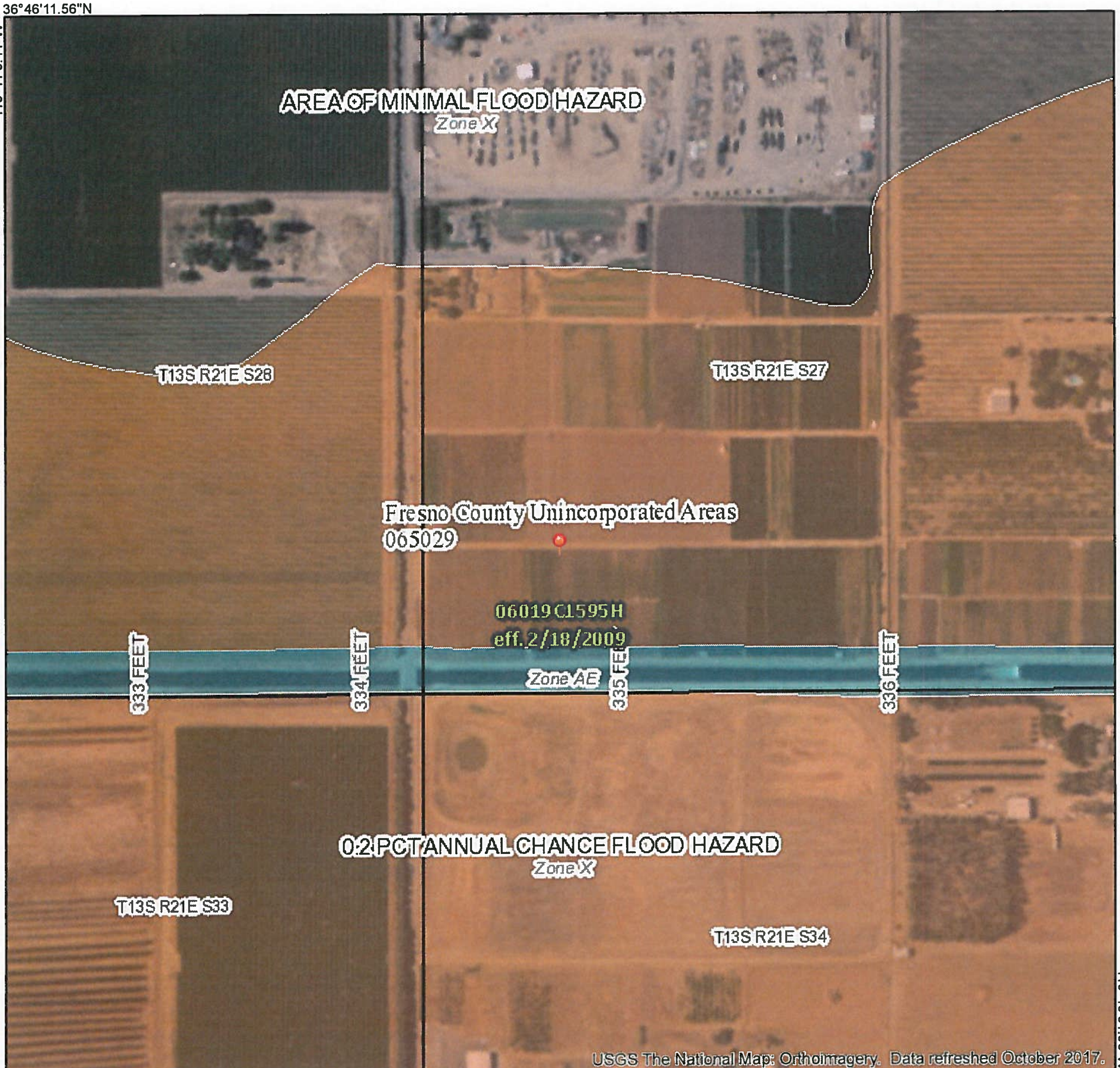
Federal Emergency Management

National Flood Hazard Layer FIRMette

FEMA

36°46'11.56"N

119°41'9.41"W



119°40'31.96"W

36°45'42.74"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X*
	Effective LOMRs
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
OTHER FEATURES	20.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
	Coastal Transect
	513 Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
MAP PANELS	Digital Data Available
	No Digital Data Available
	Unmapped

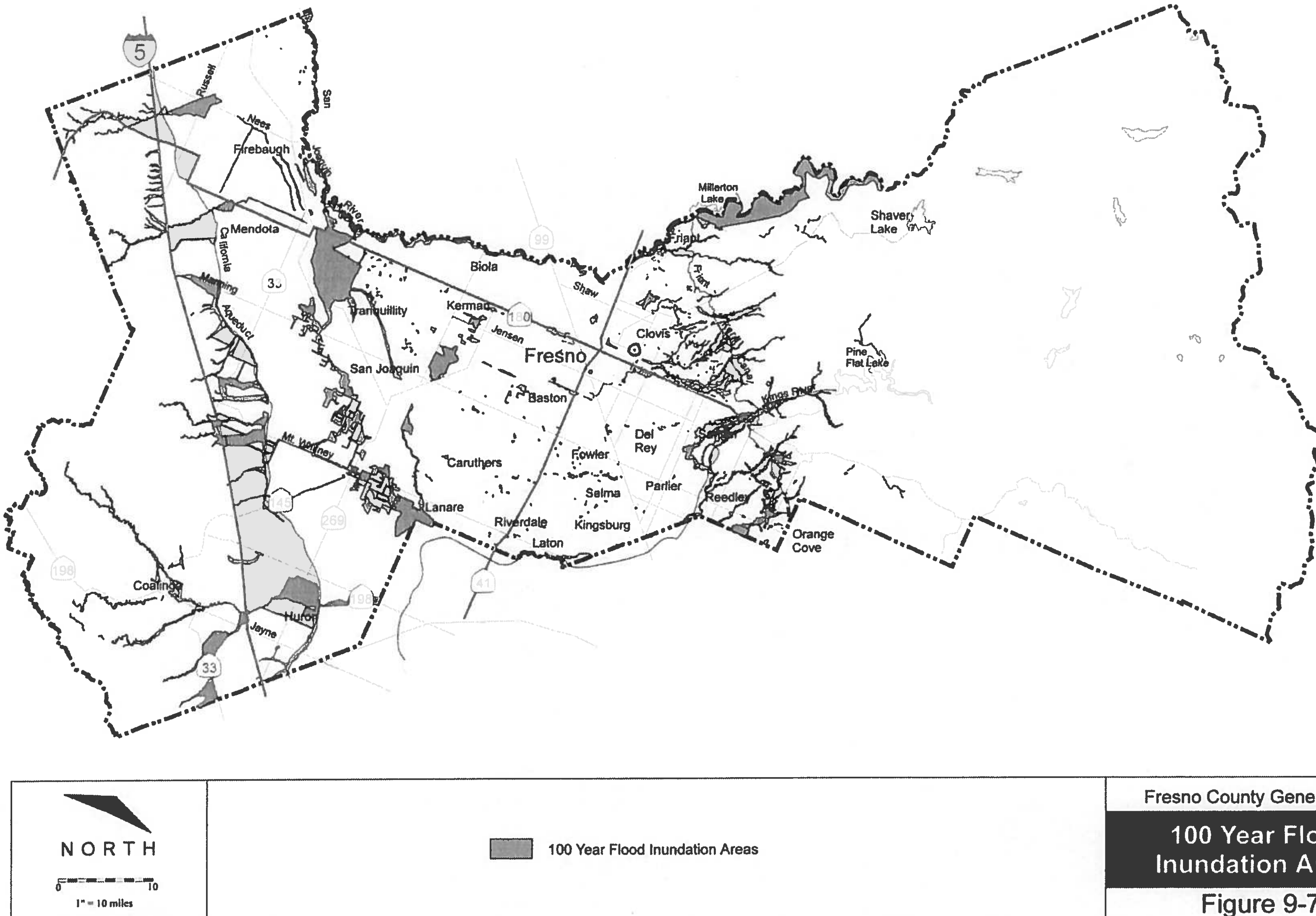
N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/16/2018 at 1:29:45 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



Fresno County General Plan

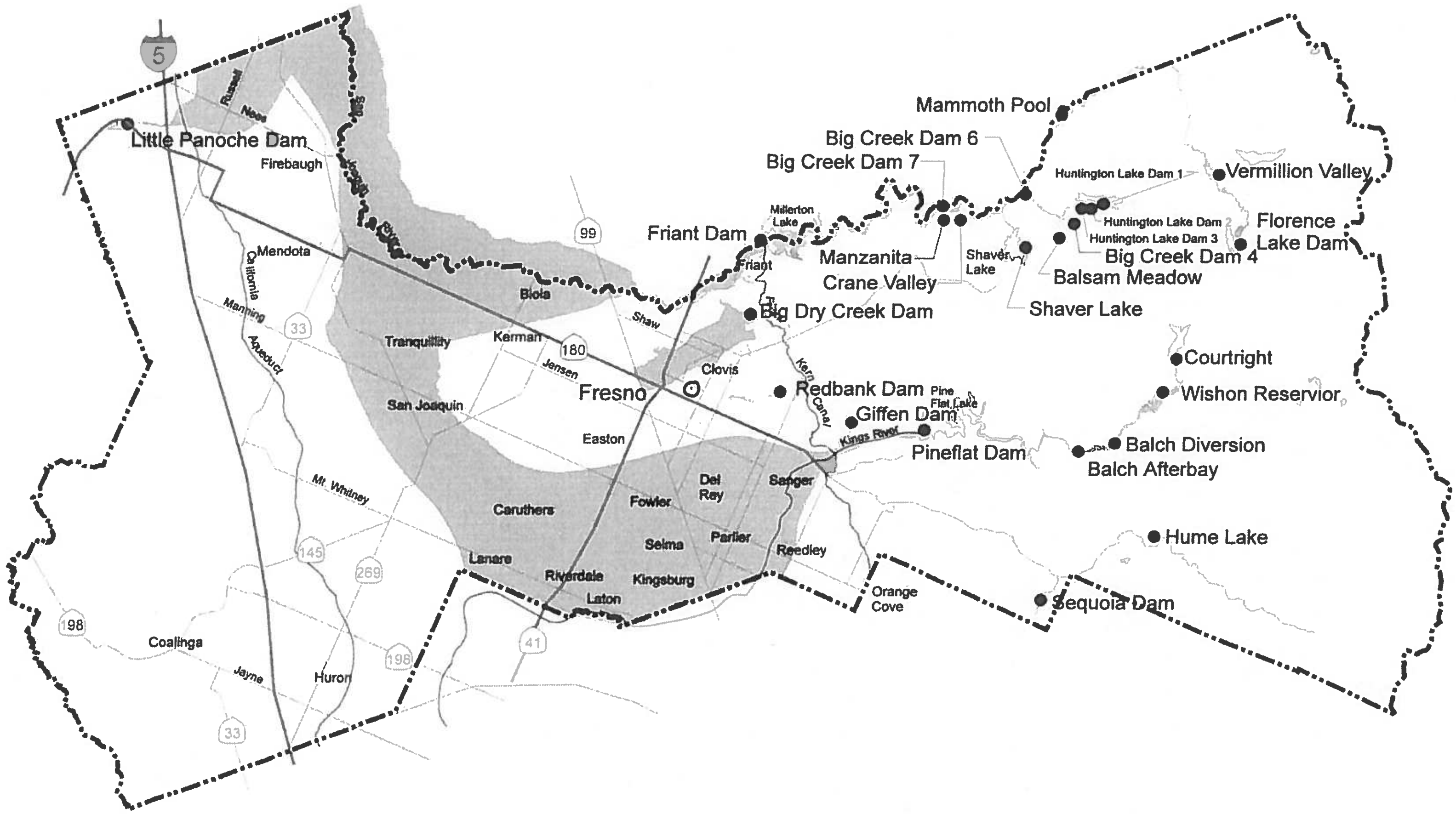
100 Year Flood Inundation Areas

Figure 9-7

Source: Fresno County GIS Database

⊙ = Site

(From Fresno, County, 2000)



NORTH

0 10

1" = 10 miles

Source: Fresno County GIS Database

Dam Failure Flood Inundation Areas

Fresno County General Plan

Dam Failure Flood Inundation Areas

Figure 9-8

⊙ = Site

(From Fresno County, 2000)

APPENDIX C

ENVIRONMENTAL HAZARD SURVEY DOCUMENTATION

Office of the State Fire Marshal

Pipeline Safety Division
P.O. Box 944246
Sacramento, CA 94244-2460

Request ID: 06152018SFM001

TO: AECOM
STUART ST. CLAIR
1360 E. SPRUCE AVENUE, STE. 101
FRESNO, CA 93720

Phone: 559 448 8222
Fax:

FROM: Lisa Dowdy

Phone: (916) 263-6300
Fax: (916) 263-3399

PIPELINE LOCATION REQUEST FOR:

FOWLER AVE & MCKINLEY AVE
FRESNO, CA 93727

THERE ARE NO PIPELINES JURISDICTIONAL TO THE STATE FIRE MARSHAL IN THE AREA FOR WHICH YOU HAVE INQUIRED.

- FOR NATURAL GAS PIPELINES PLEASE CONTACT YOUR LOCAL GAS COMPANY

- FOR OTHER TYPES OF PIPELINE PLEASE CONTACT THE DIVISION OF OIL AND GAS AT (714) 816-6847

- FOR PUBLIC UTILITIES PLEASE CONTACT THE PUBLIC UTILITIES COMMISSION AT (415) 703-2782

Disclaimer: The pipeline information and data represented in this correspondence varies in accuracy, scale, origin and completeness and may be changed at any time without notice. While the Office of the State Fire Marshal, Pipeline Safety Division (OSFM/PSD) makes every effort to provide accurate information, OSFM/PSD makes no warranties as to the suitability of this product for any particular purpose. Any use of this information is at the user's own risk.

For further information or suggestions regarding the data on this site, please contact the Office of the State Fire Marshal, Pipeline Safety Division at P.O. Box 944246, Sacramento, CA 94244 or call (916) 263-6300.

StClair, Stuart

From: Request, PRA@CALFIRE <pra.request@fire.ca.gov>
Sent: Monday, June 18, 2018 11:11 AM
To: StClair, Stuart
Subject: FW: 18-P-0553 FW: SFM Jurisdictional Hazardous Liquid Pipelines Within 1,500 Feet of School, Fowler Avenue & McKinley Avenue Alignment, East of City of Fresno, Fresno County
Attachments: Figure1_Site_Location_Map.pdf; Fowler-McKinley APN Map.pdf

Importance: High

Good Morning Mr. St. Clair:

The Department of Forestry and Fire Protection, CAL FIRE, has searched its records and has found no documents responsive to your request.

Sincerely,

Anne Henigan
CAL FIRE Legal Office

From: StClair, Stuart [mailto:stuart.stclair@aecom.com]
Sent: Thursday, June 14, 2018 3:58 PM
To: Request, PRA@CALFIRE <pra.request@fire.ca.gov>
Cc: Battles, Kathy@CALFIRE <Kathy.Battles@fire.ca.gov>
Subject: SFM Jurisdictional Hazardous Liquid Pipelines Within 1,500 Feet of School, Fowler Avenue & McKinley Avenue Alignment, East of City of Fresno, Fresno County
Importance: High

Hello,

We are working for Clovis Unified School District on a 22-acre planned new school site at the northeast corner of Fowler Avenue and the McKinley Avenue alignment, east of the city of Fresno, in Fresno County. The zip code is 93727. The site consists of one parcel (APN 310-041-15) and a portion of another parcel (APN 310-041-17). Please see attached maps.

We need to find out whether there are any SFM jurisdictional hazardous liquid pipelines within 1,500 feet of the potential high school site. Please advise.

Please let me know if you require any additional information.

Thank you very much for your help.

Best,

Stuart St. Clair, PE
Project Civil Engineer

Stuart St. Clair, PE
Project Civil Engineer, Environment
Direct: 559-490-8308
Mobile: 559-779-6311
stuart.stclair@aecom.com

AECOM
1360 E. Spruce Avenue, Suite 101
Fresno, California 93720
Telephone: 559-448-8222
aecom.com

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LinkedIn Twitter Facebook Instagram

StClair, Stuart

From: Alvarado, Eric <EXAS@pge.com>
Sent: Tuesday, June 26, 2018 1:31 PM
To: StClair, Stuart
Subject: RE: Pipeline or Powerlines near Planned School Site, Fowler Ave & McKinley Ave Alignment, East of City of Fresno, Fresno County, California

Stuart

There are no PG&E gas transmission facilities within 1,500ft of this site.

Thanks

Eric

Eric D. Alvarado

Sr. Gas Program Manager | Gas Transmission Integrity Management
Pacific Gas & Electric Company
6111 Bollinger Canyon Rd #4750D | San Ramon, Ca 94583
Office: 1-925-328-5866 | Mobile: 1-925-588-5443
Email: Eric.Alvarado@PGE.COM

From: StClair, Stuart [mailto:stuart.stclair@aecom.com]
Sent: Thursday, June 14, 2018 4:13 PM
To: Allen, Michael; Alvarado, Eric
Subject: Pipeline or Powerlines near Planned School Site, Fowler Ave & McKinley Ave Alignment, East of City of Fresno, Fresno County, California
Importance: High

*****CAUTION: This email was sent from an EXTERNAL source. Think before clicking links or opening attachments.*****

Mike/Eric

We are working for Clovis Unified School District on a 22-acre planned new school site at the northeast corner of Fowler Avenue and the McKinley Avenue alignment, east of the city of Fresno, in Fresno County. The zip code is 93727. The site consists of one parcel (APN 310-041-15) and a portion of another parcel (APN 310-041-17). Please see attached maps.

We need to know about any PG&E underground natural gas pipelines within 1,500 feet of the site, or overhead electric transmission lines (> 50kv) within 350 feet of the site. Please advise at your earliest convenience.

Please let me know if you require any additional information, or if I need to direct this request to somebody else.

Thanks,

Stuart

Stuart St. Clair, PE

Project Civil Engineer, Environment
Direct: 559-490-8308
Mobile: 559-779-6311
stuart.stclair@aecom.com

AECOM
1360 E. Spruce Avenue, Suite 101
Fresno, California 93720
Telephone: 559-448-8222
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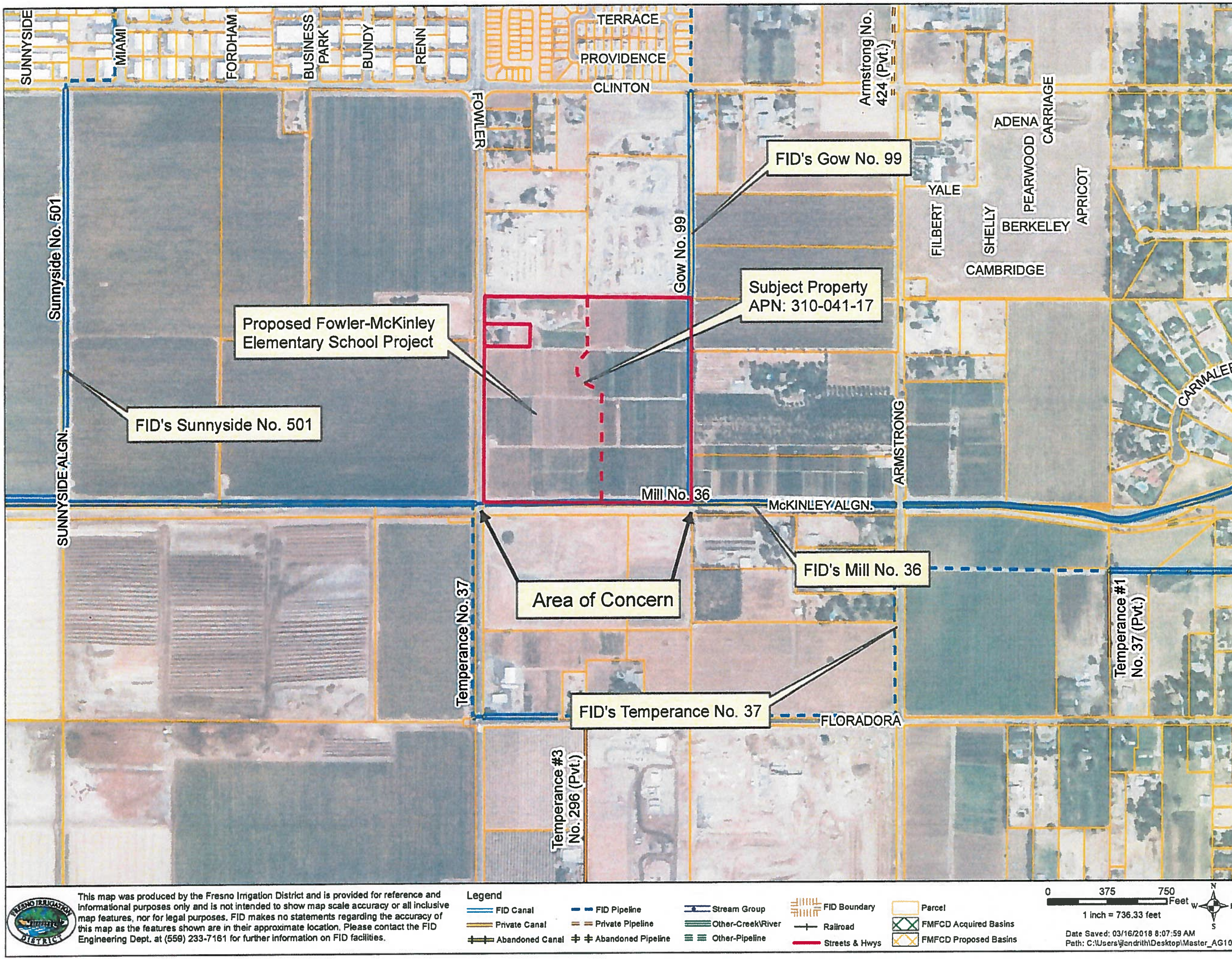

SUNNYSIDE
MIAMI
FORDHAM
BUSINESS PARK
BUNDY
RENN
TERRACE
PROVIDENCE
CLINTON
FOWLER
Armstrong No. 424 (Pvt.)
ADENA
CARRIAGE
PEARWOOD
APRICOT
YALE
FILBERT
SHELLY
BERKELEY
CAMBRIDGE
FID's Gow No. 99
Gow No. 99
Subject Property
APN: 310-041-17
Proposed Fowler-McKinley
Elementary School Project
Sunnyside No. 501
FID's Sunnyside No. 501
SUNNYSIDE ALGN.
CARMALEE
ARMSTRONG
Mill No. 36
McKINLEY ALGN.
FID's Mill No. 36
Area of Concern
Temperance No. 37
Temperance #1
No. 37 (Pvt.)
FID's Temperance No. 37
FLORADORA
Temperance #3
No. 296 (Pvt.)
FRESNO IRRIGATION DISTRICT
This map was produced by the Fresno Irrigation District and is provided for reference and informational purposes only and is not intended to show map scale accuracy or all inclusive map features, nor for legal purposes. FID makes no statements regarding the accuracy of this map as the features shown are in their approximate location. Please contact the FID Engineering Dept. at (559) 233-7161 for further information on FID facilities.
Legend
FID Canal
Private Canal
Abandoned Canal
FID Pipeline
Private Pipeline
Abandoned Pipeline
Stream Group
Other-Creek\River
Other-Pipeline
FID Boundary
Railroad
Streets & Hwys
Parcel
FMFCD Acquired Basins
FMFCD Proposed Basins
0
375
750
Feet
1 inch = 736.33 feet
N
E
S
W
Date Saved: 03/16/2018 8:07:59 AM
Path: C:\Users\jlandrith\Desktop\Master_AG10_14

StClair, Stuart

From:	Allen, Michael <MJAm@pge.com>
Sent:	Thursday, June 14, 2018 7:07 PM
To:	StClair, Stuart
Subject:	Powerlines near Fowler Ave & McKinley Ave, Fresno

Stuart,

There are two 115kV PG&E electric transmission lines running along the eastern edge of parcel 310-041-17.
Let me know if you have further questions.

Mike Allen
Senior GIS Analyst
Pacific Gas and Electric Company
415-973-6083

From: StClair, Stuart [mailto:stuart.stclair@aecom.com]
Sent: Thursday, June 14, 2018 4:13 PM
To: Allen, Michael <MJAm@pge.com>; Alvarado, Eric <EXAS@pge.com>
Subject: Pipeline or Powerlines near Planned School Site, Fowler Ave & McKinley Ave Alignment, East of City of Fresno, Fresno County, California
Importance: High

*****CAUTION: This email was sent from an EXTERNAL source. Think before clicking links or opening attachments.*****

Mike/Eric

We are working for Clovis Unified School District on a 22-acre planned new school site at the northeast corner of Fowler Avenue and the McKinley Avenue alignment, east of the city of Fresno, in Fresno County. The zip code is 93727. The site consists of one parcel (APN 310-041-15) and a portion of another parcel (APN 310-041-17). Please see attached maps.

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Please let me know if you require any additional information, or if I need to direct this request to somebody else.

Thanks,

Stuart

Stuart St. Clair, PE
Project Civil Engineer, Environment
Direct: 559-490-8308
Mobile: 559-779-6311
stuart.stclair@aecom.com

AECOM
1360 E. Spruce Avenue, Suite 101
Fresno, California 93720

Telephone: 559-448-8222
aecom.com

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County of Fresno

DEPARTMENT OF PUBLIC HEALTH
DAVID POMAVILLE, DIRECTOR

March 13, 2018

999999999
LU0019373
PE 2600

Kevin Peterson, Assistant Superintendent
Clovis Unified School District
1450 Herndon Avenue
Clovis, CA 93611

Dear Mr. Peterson:

SUBJECT: School Site Review, Clovis Unified School District, Fowler-McKinley Elementary School

LOCATION: Northeast corner of Fowler Avenue and the McKinley Avenue Alignment, Clovis, CA (APN# 311-041-17)

Pursuant to Public Resource Code 21151.8, this Department is notifying you of the following:

1. There is no record with this Department regarding whether the proposed project site is currently or formerly a hazardous waste disposal site or solid waste disposal site.

2. There is no record with this Department of a hazardous substance release associated with this site.

3. There is no record with this Department that this site contains any pipelines, situated underground or above ground, which carries hazardous substances, acutely hazardous materials, or hazardous waste, with the potential exception of a propane or natural gas line to supply propane or natural gas to the existing structures on the sites. Although the adjacent parcel, with the same address as indicated by our departmental records, contains underground storage tanks and piping associated with the fueling station.

4. This Department has no record of facilities within one-fourth mile of the school site which might reasonably be anticipated to handle hazardous or acutely hazardous materials. It should be noted that there may be other sites within one-fourth mile that this Department does not have in its current data base.

If I can be of further assistance, please contact me at (559) 600-3271.

Sincerely,

Steven Rhodes, R.E.H.S.,
Supervising Environmental Health Specialist
Environmental Health Division

STR:ds

CUSD Fowler & McKinley Elementary School.docx

PUBLIC RECORD RELEASE REQUEST FOR

AECOM
PRR Request #: C-2018-6-58

Proposed Location:
The proposed school is to be located north of McKinley Ave and east of Fowler Ave (LatLong 36.766313, -119.679827) in Fresno, CA.

The San Joaquin Valley Air Pollution District has reviewed the location according to Public Resource Code 21151.8 and makes the following conclusions:

Permitted Facilities:

- No Permitted facilities are located within a ¼ mile.

Freeway, High Volume Roadways, & Railways:

- The District recommends the PRR applicant contact CALTRANs and/or their local transportation agency to identify freeways and busy traffic corridors as defined in the Health and Safety Code.
- No Railways are located within a ¼ mile.

Other Facilities:

- There are agricultural facilities within ¼ mile of the proposed school site. These sources may reasonably be anticipated to emit hazardous compounds or handle hazardous materials from the operation of internal combustion engines driving irrigation pumps, gasoline dispensing tanks, application of pesticides, or other agricultural-related operations.

Prepared by
Will Worthley
Technical Services

Appendix 5

Noise & Groundborne Vibration Impact Analysis

NOISE & GROUNDBORNE VIBRATION IMPACT ANALYSIS

FOR

FOWLER - MCKINLEY ELEMENTARY SCHOOL PROJECT

CLOVIS UNIFIED SCHOOL DISTRICT
FRESNO COUNTY, CA

AUGUST 2018

PREPARED FOR:

ODELL PLANNING & RESEARCH, INC.
49346 ROAD 426, SUITE 2
OAKHURST, CA 93644

PREPARED BY:

AMBIENT
AIR QUALITY & NOISE CONSULTING
612 12TH STREET, SUITE 201
PASO ROBLES, CA 93446

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF COMMON TERMS AND ACRONYMS

ANSI	Acoustical National Standards Institute, Inc.
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
CUSD	Clovis Unified School District
dB	Decibels
dBA	A-Weighted Decibels
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
Hz	Hertz
HVAC	Heating Ventilation & Air Conditioning
in/sec	Inches per Second
L_{dn}	Day-Night Level
L_{eq}	Equivalent Sound Level
L_{max}	Maximum Sound Level
ppv	Peak Particle Velocity
U.S. EPA	United States Environmental Protection Agency

INTRODUCTION

This report discusses the existing setting, identifies potential noise impacts associated with implementation of the proposed project. Noise mitigation measures are recommended where the predicted noise levels would exceed applicable noise standards.

PROPOSED PROJECT SUMMARY

The proposed project includes the acquisition of a 22-acre school site and the construction and operation of an elementary school on the site. The site is located on the northeast corner of Fowler Avenue and the McKinley Avenue alignment. The elementary school would serve up to 750 students in grades TK-6. The campus would have approximately 28 classrooms, administrative offices, a multi-purpose building, hardcourt areas and athletic fields that could potentially be lighted. The school would have approximately fifty employees, including administrators, faculty, and support staff. The school would be in regular session on weekdays from late August to early June, but may host special events and classes during evenings, on weekends, and during summer recess. The project includes annexation of the site to the City of Fresno. The project site location and nearby land uses are depicted in Figure 1.

The timing for construction of the school would depend on enrollment growth and funding availability. The District estimates that the school could be constructed in approximately five years.

EXISTING SETTING

CONCEPTS AND TERMINOLOGY

ACOUSTIC FUNDAMENTALS

Noise is generally defined as sound that is loud, disagreeable, or unexpected. Sound is mechanical energy transmitted in the form of a wave because of a disturbance or vibration. Sound levels are described in terms of both amplitude and frequency.

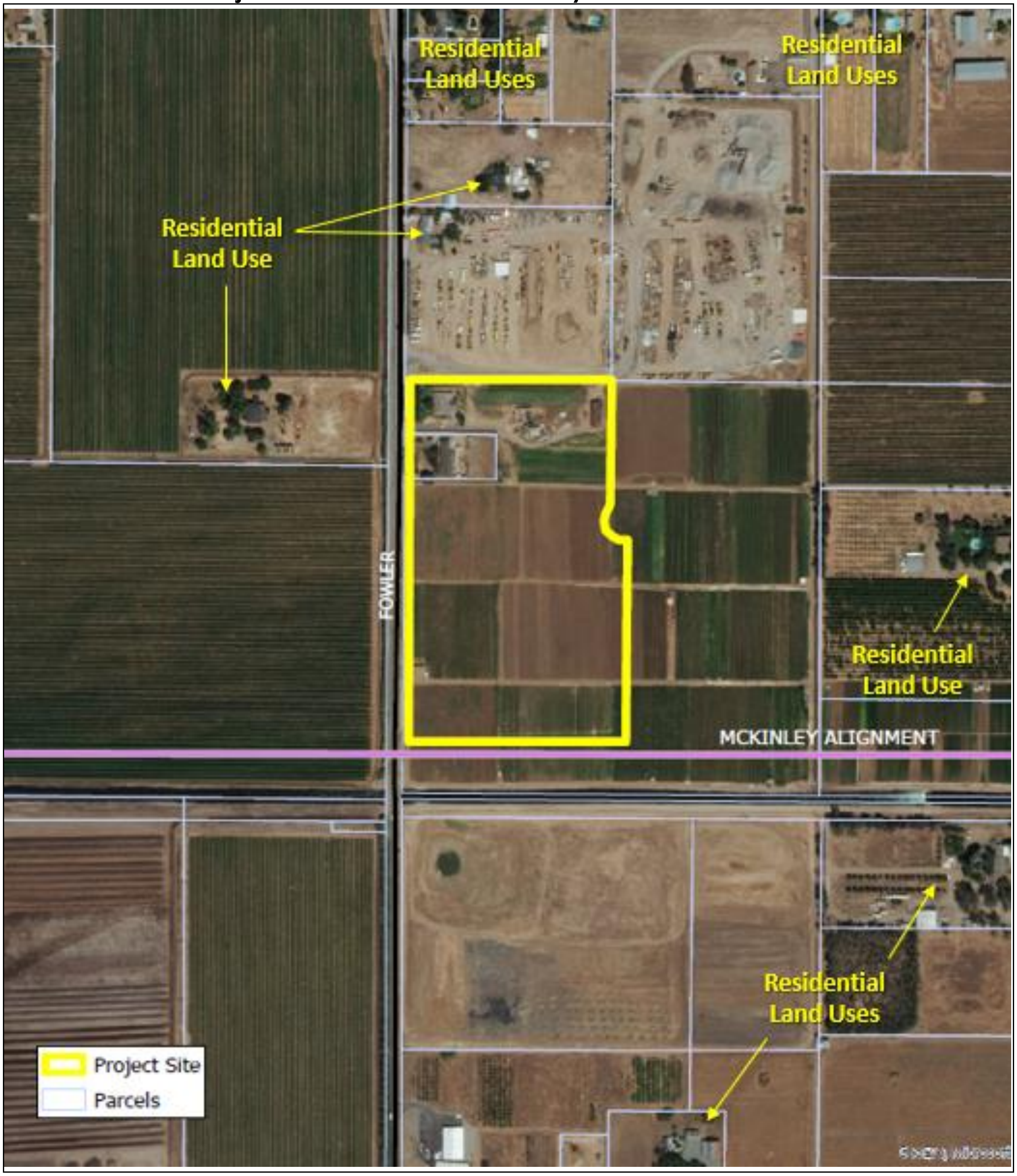
Amplitude

Amplitude is defined as the difference between ambient air pressure and the peak pressure of the sound wave. Amplitude is measured in decibels (dB) on a logarithmic scale. For example, a 65-dB source of sound, such as a truck, when joined by another 65 dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). Amplitude is interpreted by the ear as corresponding to different degrees of loudness. Laboratory measurements correlate a 10 dB increase in amplitude with a perceived doubling of loudness and establish a 3-dB change in amplitude as the minimum audible difference perceptible to the average person.

Frequency

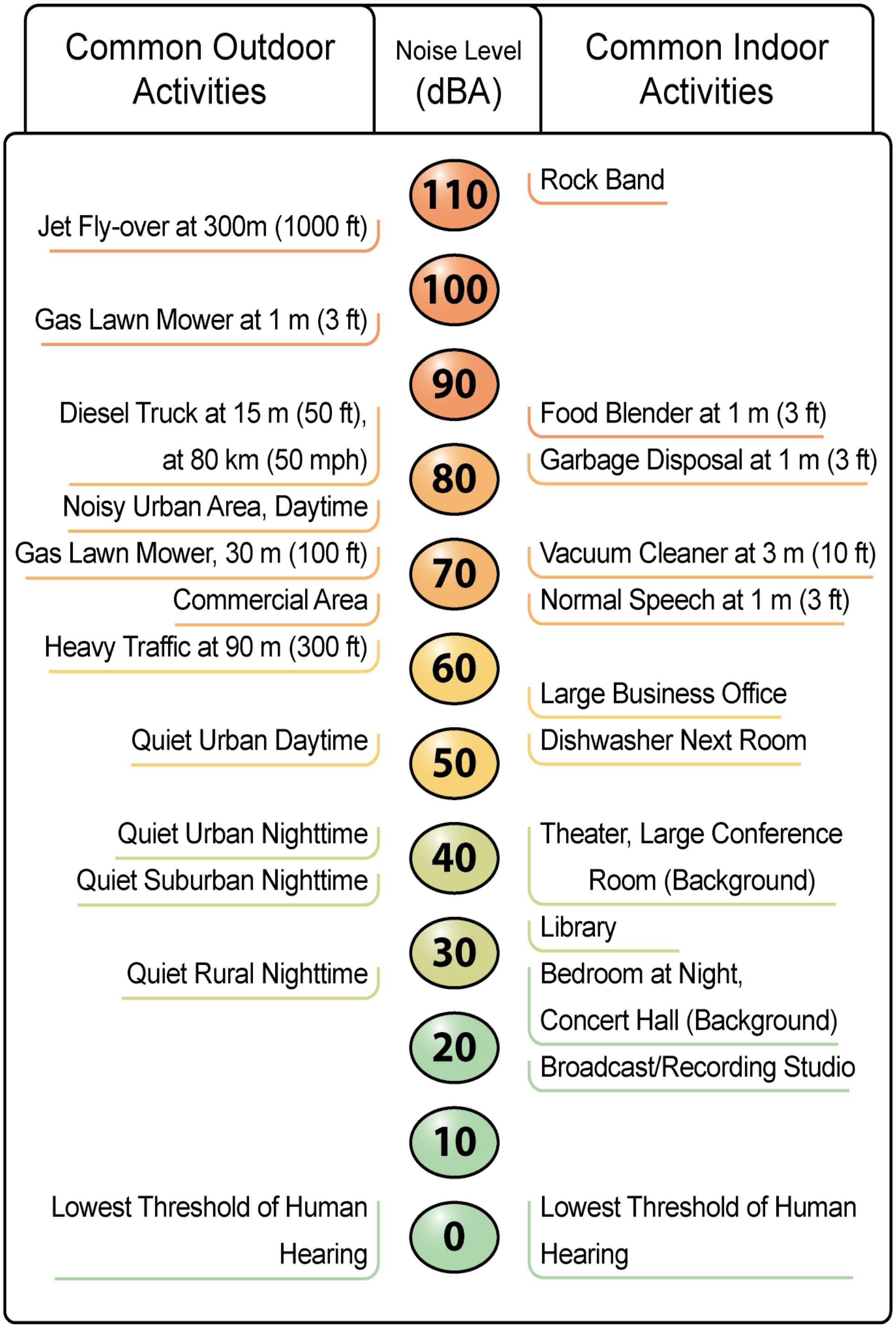
The frequency of a sound is defined as the number of fluctuations of the pressure wave per second. The unit of frequency is the Hertz (Hz). One Hz equals one cycle per second. The human ear is not equally sensitive to sound of different frequencies. For instance, the human ear is more sensitive to sound in the higher portion of this range than in the lower and sound waves below 16 Hz or above 20,000 Hz cannot be heard at all. To approximate the sensitivity of the human ear to changes in frequency, environmental sound is usually measured in what is referred to as "A-weighted decibels" (dBA). On this scale, the normal range of human hearing extends from about 10 dBA to about 140 dBA (U.S. EPA 1971). Common community noise sources and associated noise levels, in dBA, are depicted in Figure 3.

Figure 1
Project Site Location and Nearby Sensitive Land Uses



All locations are approximate. Not to scale.
Source: OPR 2018

Figure 2
Common Community Noise Sources & Noise Levels



Source: Caltrans 2018

Addition of Decibels

Because decibels are logarithmic units, sound levels cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3-dB increase. In other words, when two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dB higher than one source under the same conditions. For example, if one automobile produces a sound level of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dB; rather, they would combine to produce 73 dB. Under the decibel scale, three sources of equal loudness together would produce an increase of 5 dB.

Sound Propagation & Attenuation

Geometric Spreading

Sound from a localized source (i.e., a point source) propagates uniformly outward in a spherical pattern. The sound level decreases (attenuates) at a rate of approximately 6 decibels for each doubling of distance from a point source. Highways consist of several localized noise sources on a defined path, and hence can be treated as a line source, which approximates the effect of several point sources. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of approximately 3 decibels for each doubling of distance from a line source, depending on ground surface characteristics. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receiver, such as a parking lot or body of water,), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface between the source and the receiver, such as soft dirt, grass, or scattered bushes and trees), an excess ground-attenuation value of 1.5 decibels per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation for soft surfaces results in an overall attenuation rate of 4.5 decibels per doubling of distance from the source.

Atmospheric Effects

Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels. Sound levels can be increased at large distances (e.g., more than 500 feet) from the highway due to atmospheric temperature inversion (i.e., increasing temperature with elevation). Other factors such as air temperature, humidity, and turbulence can also have significant effects.

Shielding by Natural or Human-Made Features

A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receiver specifically to reduce noise. A barrier that breaks the line of sight between a source and a receiver will typically result in minimum 5 dB of noise reduction. Taller barriers provide increased noise reduction.

Noise reductions afforded by building construction can vary depending on construction materials and techniques. Standard construction practices typically provide approximately 15 dBA exterior-to-interior noise reductions for building facades, with windows open, and approximately 20-30 dBA, with windows closed. With compliance with current Title 24 energy efficiency standards, which require increased building insulation and inclusion of an interior air ventilation system to allow windows on noise-impacted façades to remain closed, exterior-to-interior noise reductions typically average approximately 25 dBA. The absorptive characteristics of interior rooms, such as carpeted floors, draperies and furniture, can result in further reductions in interior noise.

NOISE DESCRIPTORS

The decibel 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. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the sound-pressure level in that range. In general, people are most sensitive to the frequency range of 1,000–8,000 Hz, and perceive sounds within that range better than sounds of the same amplitude in higher or lower frequencies. To approximate the response of the human ear, sound levels of individual frequency bands are weighted, depending on the human sensitivity to those frequencies, which is referred to as the "A-weighted" sound level (expressed in units of dBA). The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Other weighting networks have been devised to address high noise levels or other special problems (e.g., B-, C-, and D-scales), but these scales are rarely used in conjunction with environmental noise.

The intensity of environmental noise fluctuates over time, and several descriptors of time-averaged noise levels are typically used. For the evaluation of environmental noise, the most commonly used descriptors are L_{eq}, L_{dn}, CNEL and SEL. The energy-equivalent noise level, L_{eq}, is a measure of the average energy content (intensity) of noise over any given period. Many communities use 24-hour descriptors of noise levels to regulate noise. The day-night average noise level, L_{dn}, is the 24-hour average of the noise intensity, with a 10-dBA "penalty" added for nighttime noise (10 p.m. to 7 a.m.) to account for the greater sensitivity to noise during this period. CNEL, the community equivalent noise level, is similar to L_{dn} but adds an additional 5-dBA penalty for evening noise (7 p.m. to 10 p.m.) Another descriptor that is commonly discussed is the single-event noise exposure level, also referred to as the sound-exposure level, expressed as SEL. The SEL describes a receiver's cumulative noise exposure from a single noise event, which is defined as an acoustical event of short duration (0.5 second), such as a backup beeper, the sound of an airplane traveling overhead, or a train whistle. Common noise level descriptors are summarized in Table 1.

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. When community noise interferes with human activities or contributes to stress, public annoyance with the noise source increases. The acceptability of noise and the threat to public well-being are the basis for land use planning policies preventing exposure to excessive community noise levels.

Unfortunately, there is no completely satisfactory way to measure the subjective effects of noise or of the corresponding reactions of annoyance and dissatisfaction. This is primarily because of the wide variation in individual thresholds of annoyance and habituation to noise over differing individual experiences with noise. Thus, an important way of determining a person's subjective reaction to a new noise is the comparison of it to the existing environment to which one has adapted: the so-called "ambient" environment. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged. Regarding increases in A-weighted noise levels, knowledge of the following relationships will be helpful in understanding this analysis:

- Except in carefully controlled laboratory experiments, a change of 1 dB cannot be perceived by humans;
- Outside of the laboratory, a 3-dB change is considered a just-perceivable difference;

- A change in level of at least 5 dB is required before any noticeable change in community response would be expected. An increase of 5 dB is typically considered substantial;
- A 10-dB change is subjectively heard as an approximate doubling in loudness and would almost certainly cause an adverse change in community response.

Table 1
Common Acoustical Descriptors

Descriptor	Definition
Energy Equivalent Noise Level (L_{eq})	The energy mean (average) noise level. The instantaneous noise levels during a specific period of time in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value (in dBA) is calculated.
Minimum Noise Level (L_{min})	The minimum instantaneous noise level during a specific period of time.
Maximum Noise Level (L_{max})	The maximum instantaneous noise level during a specific period of time.
Day-Night Average Noise Level (DNL or L_{dn})	The DNL was first recommended by the U.S. EPA in 1974 as a "simple, uniform and appropriate way" of measuring long term environmental noise. DNL takes into account both the frequency of occurrence and duration of all noise events during a 24-hour period with a 10 dBA "penalty" for noise events that occur between the more noise-sensitive hours of 10:00 p.m. and 7:00 a.m. In other words, 10 dBA is "added" to noise events that occur in the nighttime hours to account for increases sensitivity to noise during these hours.
Community Noise Equivalent Level (CNEL)	The CNEL is similar to the L_{dn} described above, but with an additional 5 dBA "penalty" added to noise events that occur between the hours of 7:00 p.m. to 10:00 p.m. The calculated CNEL is typically approximately 0.5 dBA higher than the calculated L_{dn}.
Sound Exposure Level (SEL)	The level of sound accumulated over a given time interval or event. Technically, the sound exposure level is the level of the time-integrated mean square A-weighted sound for a stated time interval or event, with a reference time of one second.

Effects of Noise on Human Activities

The extent to which environmental noise is deemed to result in increased levels of annoyance, activity interference, and sleep disruption varies greatly from individual to individual depending on various factors, including the loudness or suddenness of the noise, the information value of the noise (e.g., aircraft overflights, child crying, fire alarm), and an individual's sleep state and sleep habits. Over time, adaptation to noise events and increased levels of noise may also occur. In terms of land use compatibility, environmental noise is often evaluated in terms of the potential for noise events to result in increased levels of annoyance, sleep disruption, or interference with speech communication, activities, and learning. Noise-related effects on human activities are discussed in more detail, as follows:

Speech Communication

For most noise-sensitive land uses, an interior noise level of 45 dB L_{eq} is typically identified for the protection of speech communication in order to provide for 100-percent intelligibility of speech sounds. Assuming a minimum 20-dB reduction in sound level between outdoors and indoors, with windows closed, this interior noise level of 45 dB L_{eq} would equate to an exterior noise level of 65 dBA L_{eq}. For outdoor voice communication, an exterior noise level of 60 dBA L_{eq} allows normal conversation at distances up to 2 meters with 95 percent sentence intelligibility (U.S. EPA 1974.) Based on this information, speech interference begins to become a problem when steady noise levels reach approximately 60 to 65 dBA. Within interior noise environments, an average-hourly background noise level of 45 dBA L_{eq} is typically recommended for noise-sensitive land uses, such as educational facilities (Caltrans 2002).

Learning

Closely related to speech interference are the effects of noise on learning and, more broadly, on cognitive tasks. Recent studies have shown a strong relationship between noise and children's reading ability. Children's attention spans also appear to be adversely affected by noise. Adults are affected as well. Some studies indicate that, in a noisy environment, adults have increased difficulty accomplishing complex tasks. One of the issues associated with assessment of these effects is which noise metric correlates most closely with the impacts. For example, the average-daily noise level (i.e., CNEL/L_{dn}), which incorporates a nighttime weighting, may not be the best measure of noise impacts on schools given that operational activities are often limited to the daytime hours (Caltrans 2002).

Various standards and recommended criteria have been developed to specifically address classroom noise. For instance, with regard to transportation sources, the California Department of Transportation has adopted abatement criteria that limit the maximum interior average-hourly noise level within classrooms, as well as other noise-sensitive interior uses, to 52 dBA L_{eq}. In June 2002, the American National Standards Institute, Inc. (ANSI) released a new classroom acoustics standard entitled Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools" (ANSI S12.60-2002). For schools exposed to intermittent background noise sources, such as airport and other transportation noise, the ANSI standards recommend that interior noise levels not exceed 40 dBA L_{eq} during the noisiest hour of the day. At present complying with the ANSI-recommended standard is voluntary in most locations.

Annoyance & Sleep Disruption

With regard to potential increases in annoyance, activity interference, and sleep disruption, land use compatibility determinations are typically based on the use of the cumulative noise exposure metrics (i.e., CNEL or L_{dn}). Perhaps the most comprehensive and widely accepted evaluation of the relationship between noise exposure and the extent of annoyance was one originally developed by Theodore J. Schultz in 1978. In 1978 the research findings of Theodore J. Schultz provided support for L_{dn} as the descriptor for environmental noise. Research conducted by Schultz identified a correlation between the cumulative noise exposure metric and individuals who were highly annoyed by transportation noise. The Schultz curve, expressing this correlation, became a basis for noise standards. When expressed graphically, this relationship is typically referred to as the Schultz curve. The Schultz curve indicates that approximately 13 percent of the population is highly annoyed at a noise level of 65 dBA L_{dn}. It also indicates that the percent of people describing themselves as being highly annoyed accelerates smoothly between 55 and 70 dBA L_{dn}. A noise level of 65 dBA L_{dn} is a commonly referenced dividing point between lower and higher rates of people describing themselves as being highly annoyed (Caltrans 2002).

The Schultz curve and associated research became the basis for many of the noise criteria subsequently established for federal, state, and local entities. Most federal and state of California regulations and policies related to transportation noise sources establish a noise level of 65 dBA CNEL/L_{dn} as the basic limit of acceptable noise exposure for residential and other noise-sensitive land uses. For instance, with respect to aircraft noise, both the Federal Aviation Administration (FAA) and the State of California have identified a noise level of 65 dBA L_{dn} as the dividing point between normally compatible and normally incompatible residential land use generally applied for determination of land use compatibility. For noise-sensitive land uses exposed to aircraft noise, noise levels in excess of 65 dBA CNEL/L_{dn} are typically considered to result in a potentially significant increase in levels of annoyance (Caltrans 2002).

Allowing for an average exterior-to-interior noise reduction of 20 dB, an exterior noise level of 65 dBA CNEL/L_{dn} would equate to an interior noise level of 45 dBA CNEL/L_{dn}. An interior noise level of 45 dB CNEL/L_{dn} is generally considered sufficient to protect against activity interference at most noise-sensitive land uses, including residential dwellings, and would also be sufficient to protect against sleep interference (U.S. EPA 1974.) Within California, the California Building Code establishes a noise level of 45 dBA CNEL as the maximum acceptable interior noise level for residential uses (other than detached single-family dwellings). Use of the 45 dBA CNEL threshold is further supported by recommendations provided in the State of California Office of Planning and Research's *General Plan Guidelines*, which recommend an interior noise level of 45 dB CNEL/L_{dn} as the maximum allowable interior noise level sufficient to permit "normal residential activity."

The cumulative noise exposure metric is currently the only noise metric for which there is a substantial body of research data and regulatory guidance defining the relationship between noise exposure, people's reactions, and land use compatibility. However, when evaluating environmental noise impacts involving intermittent noise events, such as aircraft overflights and train passbys, the use of cumulative noise metrics may not provide a thorough understanding of the resultant impact. The general public often finds it difficult to understand the relationship between intermittent noise events and cumulative noise exposure metrics. In such instances, supplemental use of other noise metrics, such as the L_{eq} or L_{max} descriptor, may be helpful as a means of increasing public understanding regarding the relationship between these metrics and the extent of the resultant noise impact (Caltrans 2002).

AFFECTED ENVIRONMENT

NOISE-SENSITIVE LAND USES

Noise-sensitive land uses are generally considered to include those uses where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Additional land uses such as parks, historic sites, cemeteries, and recreation areas are also considered sensitive to increases in exterior noise levels. Schools, churches, hotels, libraries, and other places where low interior noise levels are essential are also considered noise-sensitive land uses.

Sensitive land uses located in the vicinity of the proposed project site consist predominantly of rural residential land uses. The nearest residential land use is located approximately 350 feet west of the project site, across Fowler Avenue. Residential land uses are also located approximately 420 feet to the north, 950 feet to the east, and 1,170 feet to the south. Nearby residential land uses are depicted in Figure 1.

AMBIENT NOISE ENVIRONMENT

Ambient noise levels within the project area are predominantly influenced by vehicle traffic on Fowler Avenue. To document existing ambient noise levels in the project area, short-term ambient noise measurements were conducted on August 7, 2018 using a Larson Davis Laboratories, Type I, Model 820 integrating sound-level meter. A noise measurement survey was also conducted along Clinton Avenue, between Clovis Avenue and Fowler Avenue, for purposes of calibrating the traffic noise model used in this analysis. The meter was calibrated before use and is certified to be in compliance with ANSI specifications. Measured ambient noise levels are summarized in Table 2.

Table 2
Summary of Measured Ambient Noise Levels

Location	Monitoring Period	Noise Levels (dBA)	
		L_{eq}	L_{max}
Fowler Avenue/Western Site Boundary. Approximately 40 feet from road centerline.	07:20 – 07:30	67.2	77.8
	16:30 – 16:40	66.4	78.2
Clinton Avenue West of Clovis Avenue. Approximately 35 feet from road centerline.	17:05 – 17:15	65.1	78.4
Ambient noise measurements were conducted on August 7, 2018 using a Larson Davis Laboratories, Type I, Model 820 integrating sound-level meter.			

As indicated in Table 2, measured daytime ambient noise levels along the western boundary of the project site ranged from approximately 66 to 67 dBA L_{eq} during the peak commute hours. Ambient noise levels during the evening and nighttime hours are generally 5 to 10 dB lower than daytime noise levels. Based on these measured noise levels, the predicted existing 65 dBA CNEL traffic noise contour would extend to a distance of approximately 76 feet from the centerline of Fowler Avenue.

REGULATORY FRAMEWORK

NOISE

State of California

The State of California regulates vehicular and freeway noise affecting classrooms, sets standards for sound transmission and occupational noise control, and identifies noise insulation standards and airport noise/land-use compatibility criteria.

<u>*California General Plan Guidelines*</u>

The *State of California General Plan Guidelines*, published by the Governor's Office of Planning and Research (OPR 2003), also provides guidance for the acceptability of projects within specific CNEL/L_{dn} contours. The guidelines also present adjustment factors that may be used in order to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution. For school land uses, the *State of California General Plan Guidelines* identify a "normally acceptable" exterior noise level of up to 70 dBA CNEL/L_{dn}. Schools are considered "conditionally acceptable" within noise environments of 60 to 70 dBA CNEL/L_{dn} and "normally unacceptable" within exterior noise environments of 70 to 80 CNEL/L_{dn} and "clearly unacceptable" within exterior noise environments in excess of 80 dBA CNEL/L_{dn}. Assuming a minimum exterior-to-interior noise reduction of 20 dB, an exterior noise environment of 65 dBA CNEL/L_{dn} would allow for a normally acceptable interior noise level of 45 dBA CNEL/L_{dn}.

Fresno County

The Fresno County General Plan Noise Element includes noise standards for determination of land use compatibility. These standards apply to newly proposed land uses. Accordingly, school land uses are considered "normally acceptable" within exterior environments up to 65 dBA CNEL/L_{dn} and "conditionally acceptable" within areas up to 75 dBA CNEL/L_{dn}, provided necessary noise-reduction measures have been incorporated (County of Fresno 2000).

The Fresno County Noise Ordinance also establish noise criteria for determination of acceptable noise exposure for various land uses. The intent of the Fresno County Noise Control Ordinance is "…to protect persons from excessive levels of noise within or near a residence, school, church, hospital or public library and to warn persons of the hazards of excessive noise in places of public entertainment." The County's exterior and interior noise ordinance standards are summarized in Tables 3 and 4, respectively (County of Fresno 2018b).

The County's noise ordinance limits are stated in terms of the cumulative number of minutes in any one-hour time period that the noise level is allowed to exceed. These standards are typically referred to as the n-percent exceeded level (L_n). The L_n is the sound pressure level exceeded for n percent of the time. For instance, the "L_{50}" represents the sound level not to be exceeded 50% of the time, or 30 minutes within a one-hour time period. Likewise, a fifteen-minute limitation is expressed as the L_{25}, a five-minute limitation is expressed as the L_8, and a one-minute limitation is expressed as the L_2. The L_0 represents the noise level not to be exceeded at any time, which is also often referred to as the L_{max}. For most sources, the L_{50} is also representative of the energy-equivalent sound level, represented as "L_{eq}". It is important to note that the County's noise ordinance standards apply to stationary noise sources, such as industrial activities and equipment. Activities conducted in public parks, public playgrounds, and public or private school grounds, including but not limited to school athletic and school entertainment events, are exempt from the County's noise ordinance standards.

Table 3
County of Fresno Exterior Noise Ordinance Standards

Category	Cumulative Number of Minutes in any One-Hour Time Period	Noise Level Standards, dBA	
		Daytime (7 a.m. to 10 p.m.)	Nighttime (10 a.m. to 7 p.m.)
1	30 (L_{50})	50	45
2	15 (L_{25})	55	50
3	5 (L_8)	60	55
4	1 (L_2)	65	60
5	0 (L_0/L_{max})	70	65

Notes:
A. *It is unlawful for any person, including an owner, whether through the owner or the owner's agent, lessee, sublessor, sublessee or occupant, at any location within the unincorporated area of the county, to create any noise, or to allow the creation of any noise, on property owned, leased, occupied or otherwise controlled by such person which causes the exterior noise level when measured at any affected single- or multiple-family residence, school, hospital, church or public library situation in either the incorporated or unincorporated area to exceed the noise level standards.*
B. *In the event the measured ambient noise level exceeds the applicable noise level standard in any category above, the applicable standard shall be adjusted so as to equal the ambient noise level.*
C. *Each of the noise level standards specified above shall be reduced by five dB(A) for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises.*
D. *If the intruding noise source is continuous and cannot reasonably be discontinued or stopped for a time period whereby the ambient noise level can be measured, the noise level measured while the source is in operation shall be compared directly to the noise level standards.*
Source: County of Fresno 2018b

Table 4
County of Fresno Interior Noise Ordinance Standards

Category	Cumulative Number of Minutes in any One-Hour Time Period	Noise Level Standards, dBA	
		Daytime (7 a.m. to 10 p.m.)	Nighttime (10 a.m. to 7 p.m.)
1	5 (L_8)	45	35
2	1 (L_2)	50	40
3	0 (L_0/L_{max})	55	45

Notes:
A. *It is unlawful for any person, at any location within the unincorporated area of the county to operate or cause to be operated within a dwelling unit, any source of sound or to allow the creation of any noise which causes the noise level when measured inside a receiving dwelling unit situated in either the incorporated or unincorporated are to exceed the noise level standards.*
B. *In the event the measured ambient noise level exceeds the applicable noise level standard in any category above, the applicable standard shall be adjusted so as to equal the ambient noise level.*
C. *Each of the noise level standards specified above shall be reduced by five dB(A) for simple tone noises, noises consisting primarily of speech or music, or for recurring impulse noises.*
D. *If the intruding noise source is continuous and cannot reasonably be discontinued or stopped for a time period whereby the ambient noise level can be measured, the noise level measured while the source is in operation shall be compared directly to the noise level standards.*
Source: County of Fresno 2018b

City of Fresno

The *Fresno General Plan Noise and Safety Element* includes noise standards for both stationary and transportation noise sources for determination of land use compatibility. In accordance with General Plan policies, new noise-sensitive land uses impacted by existing or projected future transportation or stationary noise sources shall include mitigation measures so that resulting noise levels do not exceed these standards (City of Fresno 2014). The land use compatibility noise standards for stationary and transportation noise sources are summarized in Tables 3 and 4, respectively. In addition, Policy NS-1-a of the *Fresno General Plan Noise and Safety Element* also establishes an exterior noise standard of 60 dBA CNEL/L_{dn} for new non-transportation noise sources that impinge on noise-sensitive land uses, such as residential dwellings. This noise standard is applied at the property line of the noise-sensitive land use.

The City of Fresno has also adopted a noise ordinance that contains additional limitations intended to prevent noise which may create dangerous, injurious, noxious, or otherwise objectionable conditions. As opposed to the City's General Plan noise standards, the City's noise ordinance is primarily used for the regulation of existing uses and activities, including construction activities, and are not typically used as a basis for land use planning. Construction activities occurring during the daytime hours of 7:00 a.m. to 10:00 p.m., Monday through Saturday, are typically considered exempt from the City's noise ordinance requirements (City of Fresno 2016). In accordance with Section 15-2506(H) of the City's noise ordinance, the sounding of school bells and school-sanctioned outdoor activities such as pep rallies, sports games, and band practices are exempt from the City's noise ordinance standards.

Table 5
City of Fresno General Plan Noise Standards - Stationary Noise Sources

Noise Descriptor	Noise Level Standards (dBA)[1]	
	Daytime (7 am - 10 pm)	Nighttime (10 pm – 7 am)
Hourly Equivalent Sound Level (L_{eq})	50	45
Maximum Sound Level (L_{max})	70	65

Notes:

1. *The Department of Development and Resource Management Director, on a case-by-case basis, may designate land uses other than those shown in this table to be noise-sensitive, and may require appropriate noise mitigation measures.*
2. *As determined at outdoor activity areas. Where the location of outdoor activity areas is unknown or not applicable, the noise exposure standard shall be applied at the property line of the receiving land use. When ambient noise levels exceed or equal the levels in this table, mitigation shall only be required to limit noise to the ambient plus five dB.*

Source: City of Fresno 2014

Table 6
City of Fresno General Plan Noise Standards - Transportation Noise Sources

Land Use[1]	Outdoor Activity Areas[2,3] (CNEL/L_{dn} dBA)	Interior Spaces (dBA)[3]	
		Average Daily (CNEL/L_{dn})	Average Hourly (L_{eq}) [2]
Residential	65	45	--
Transient Lodging	65	45	--
Hospitals, Nursing Homes	65	45	--
Theaters, Auditoriums, Music Halls	--	--	35
Churches, Meeting Halls	65	--	45
Office Buildings	--	--	45
Schools, Libraries, Museums	--	--	45

1. *Where the location of outdoor activity areas is unknown or is not applicable, the exterior noise level standard shall be applied to the property line of the receiving land use.*
2. *As determined for a typical worst-case hour during periods of use.*
3. *Noise standards do not apply to aircraft noise.*

Source: City of Fresno 2014

GROUNDBORNE VIBRATION

Vibration is like noise in that it involves a source, a transmission path, and a receiver. While vibration is related to noise, it differs in that noise is generally considered to be pressure waves transmitted through air, whereas vibration usually consists of the excitation of a structure or surface. As with noise, vibration consists of an amplitude and frequency. A person's perception to the vibration will depend on their individual sensitivity to vibration, as well as the amplitude and frequency of the source and the response of the system which is vibrating. Vibration can be measured in terms of acceleration, velocity, or displacement.

The effects of groundborne vibration levels, with regard to human annoyance and structural damage, is influenced by various factors, including ground type, distance between source and receptor, and duration. Overall effects are also influenced by the type of the vibration event, defined as either continuous or transient. Continuous vibration events would include most construction equipment, including pile drivers, and compactors; whereas, transient sources of vibration create single isolated vibration events, such as demolition ball drops and blasting. Threshold criteria for continuous and transient events are summarized in Tables 6 and 7, respectively.

Table 7
Damage Potential to Buildings at Various Groundborne Vibration Levels

Structure and Condition	Vibration Level (in/sec ppv)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely Fragile Historic Buildings, Ruins, Ancient Monuments	0.12	0.08
Fragile Buildings	0.2	0.1
Historic and Some Old Buildings	0.5	0.25
Older Residential Structures	0.5	0.3
New Residential Structures	1.0	0.5
Modern Industrial/Commercial Buildings	2.0	0.5

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Source: Caltrans 2013

Table 8
Annoyance Potential to People at Various Groundborne Vibration Levels

Human Response	Vibration Level (in/sec ppv)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Barely Perceptible	0.04	0.01
Distinctly Perceptible	0.25	0.04
Strongly Perceptible	0.9	0.10
Annoying to People in Buildings	--	0.2
Severe	2.0	0.4

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

-- Not Available

Source: Caltrans 2013

As indicated in Table 7, the threshold at which there is a risk to normal structures from continuous events is 0.3 in/sec ppv for older residential structures and 0.5 in/sec ppv for newer building construction. A threshold of 0.5 in/sec ppv also represents the structural damage threshold applied to older structures for transient vibration sources. With regard to human perception (refer to Table 8), vibration levels would begin to become distinctly perceptible at levels of 0.04 in/sec ppv for continuous events and 0.25 in/sec ppv for transient events. Continuous vibration levels are considered annoying for people in buildings at levels of 0.2 in/sec ppv.

IMPACTS AND MITIGATION MEASURES

METHODOLOGY

Short-Term Construction Noise

Short-term noise impacts associated with construction activities were analyzed based on typical construction equipment noise levels and distances to the nearest noise-sensitive land uses. Noise levels were predicted based on an average noise-attenuation rate of 6 dB per doubling of distance from the source.

Long-term Operational Noise

Roadway Traffic Noise

Traffic noise levels were calculated using the Federal Highway Administration (FHWA) roadway noise prediction model (FHWA-RD-77-108) based on California vehicle reference noise levels and traffic data obtained from the traffic analysis prepared for this project. Additional input data included day/night percentages of autos, medium and heavy trucks, vehicle speeds, ground attenuation factors, and roadway widths. The project's contribution to traffic noise levels along area roadways was determined by comparing the predicted noise levels with and without project-generated traffic. The compatibility of the proposed school was evaluated based on predicted future on-site noise conditions and in comparison to the County of Fresno's "normally acceptable" exterior exterior standard of 65 dBA CNEL/L_{dn}.

The *CEQA Guidelines* do not define the levels at which temporary and permanent increases in ambient noise are considered "substantial." As discussed previously in this section, a noise level increase of 3 dBA is barely perceptible to most people, a 5 dBA increase is readily noticeable, and a difference of 10 dBA would be perceived as a doubling of loudness. For purposes of this analysis, a significant increase in ambient noise levels would be defined as an increase of 3 dBA, or greater.

Non-Transportation Noise

Noise levels associated with on-site vehicle parking activities were calculated in accordance with FHWA's *Transit Noise and Vibration Impact Assessment Guidelines* (2006) assuming a reference noise level of 92 dBA SEL. Average-hourly noise levels associated with vehicle parking-related activities were calculated based on the conservative assumption that all parking spaces would be accessed over a one-hour period. Noise levels generated by other on-site noise sources, including on-site building mechanical equipment and recreational uses were assessed based on representative noise data obtained from similar land uses. Operational noise levels for non-transportation noise sources were assumed to be limited to the daytime hours of operation, consistent with school operational hours.

Non-transportation noise levels for parking areas and building mechanical equipment were compared to the City/County of Fresno's daytime noise standard of 50 dBA L_{eq}/L_{50} for determination of impact significance. Because recreational uses are exempt from the County/City noise ordinance standards, recreational noise levels at nearby land uses were evaluated in comparison to the City's General Plan noise standard of 60 dBA CNEL/L_{dn} for determination of impact significance.

Groundborne Vibration

The *CEQA Guidelines* also do not define the levels at which groundborne vibration levels would be considered excessive. For this reason, Caltrans' recommended groundborne vibration thresholds were used for the evaluation of impacts based on increased potential for structural damage and human annoyance, as identified in Table 7 and Table 8, respectively. Caltrans considers a peak particle velocity (ppv) threshold of 0.2 inches per second (in/sec) to be the level at which architectural damage (i.e., minor cracking of plaster walls and ceilings) to normally-constructed buildings may occur. Short periods of ground vibration in excess of 0.1 in/sec ppv (0.2 in/sec ppv within buildings) can be expected to result in increased levels of annoyance (Caltrans 2013).

PROJECT IMPACTS

Impact Noise-A:	***Would the project result in the exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?***

The Fresno County General Plan Noise Element includes noise standards for determination of land use compatibility for new land uses. As previously discussed, the County's "normally acceptable" exterior noise standards for schools is 65 dBA CNEL/L_{dn}.

As noted earlier in this report, ambient noise levels in the project area are largely influenced by traffic noise emanating from Fowler Avenue. Under future cumulative conditions, with project-generated vehicle traffic included, the predicted 65 dBA CNEL/L_{dn} noise contours for Fowler Avenue and the future McKinley Avenue extension would extend to approximately 182 and 75 feet, respectively, from the roadway centerline. The location of on-site structures has not yet been determined. As a result, it is conceivable that on-site structures could be located within the projected future 65 dBA CNEL contours of these nearest roadways. Predicted exterior noise levels at onsite structures could, therefore, potentially exceed the County's "normally acceptable" exterior noise standard of 65 dBA CNEL/L_{dn}. In addition, depending on the location of onsite structures, predicted interior traffic noise levels could potentially exceed the commonly applied interior noise standard of 45 dBA CNEL/L_{dn}. This impact is considered ***potentially significant***.

Mitigation Measure Noise-1: The following measures shall be implemented to reduce long-term on-site operational noise impacts:

- Structures to be used for education instruction purposes shall not be located closer than 182 feet of the centerline of Fowler Avenue or 75 from the centerline of McKinley Avenue.

    Timing/Implementation: Prior to Construction
    Enforcement/Monitoring: Clovis Unified School District

Significance After Mitigation: With implementation of the above mitigation measure, on-site structures would not be located within the projected future 65 dBA CNEL contours of the adjacent roadways. Assuming an average exterior-to-interior noise reduction of 25 dBA, which is typical for new building construction, predicted interior noise levels would be approximately 40 dBA CNEL, or less. With mitigation, predicted on-site noise levels at educational-use facilities would not exceed the County's "normally acceptable" exterior noise standard of 65 dBA CNEL/L_{dn}, nor the commonly applied interior noise standard of 45 dBA CNEL/L_{dn}. As a result, increases in noise levels associated with facility maintenance activities *would be* considered ***less than significant***.

Impact Noise-B	***Would the project result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?***

Long-term operational activities associated with the proposed project would not involve the use of any equipment or processes that would result in potentially significant levels of ground vibration. Increases in groundborne vibration levels attributable to the proposed project would be primarily associated with short-term construction-related activities. Construction activities associated with the proposed improvements would likely require the use of various off-road equipment, such as tractors, concrete mixers, and haul trucks. The use of major groundborne vibration-generating construction equipment, such as pile drivers, would not be required for this project.

Groundborne vibration levels associated with representative construction equipment are summarized in Table 8. As depicted, ground vibration generated by construction equipment would be approximately 0.08 in/sec ppv, or less, at 25 feet. Predicted vibration levels at the nearest existing structures would not exceed the minimum recommended criteria for structural damage and human annoyance (0.2 in/sec ppv, respectively). As a result, this impact would be considered ***less than significant***.

Table 9
Representative Vibration Source Levels for Construction Equipment

Equipment	Peak Particle Velocity at 25 Feet (In/Sec)
Loaded Trucks	0.076
Jackhammer	0.035
Small Bulldozers/Tractors	0.003
Source: FTA 2006, Caltrans 2004	

Impact Noise-C ***Would the project result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?***

Long-term increases in ambient noise levels associated with the proposed project would be associated with increases in vehicle traffic along area roadways. To a lesser extent, on-site non-transportation noise sources would also contribute to potential increases in ambient noise levels. Noise levels associated with project-generated traffic and non-transportation sources are discussed below.

<u>Roadway Traffic</u>

Predicted existing traffic noise levels, with and without implementation of proposed project, are summarized in Table 9. In comparison to existing traffic noise levels, the proposed project would result in a predicted increase in traffic noise levels of approximately 0.1 to 1.3 dBA.

Predicted increases in future cumulative traffic noise levels along nearby roadways for proposed project are summarized in Table 10. In future years, the project's contribution to cumulative traffic noise levels would be anticipated to decline as increases in vehicle traffic due to surrounding development increases. Under future cumulative conditions, the proposed project would result in predicted increases in traffic noise levels of approximately 0.1 to 1.4 dBA.

As noted earlier in this report, changes in ambient noise levels of approximately 3 dBA, or less, are typically not discernible to the human ear and would not be considered to result in a significant impact. Implementation of the proposed project would not result in a significant increase in traffic noise levels along area roadways. Other less-affected area roadways would, likewise, not experience a significant increase in traffic noise levels. Project-generated increases in traffic noise levels would be considered to have a ***less-than-significant*** impact.

<u>Mechanical Building Equipment</u>

Existing Residential Land Uses

The proposed project would include the construction of new buildings, primarily within the southeastern portion of the project site (refer to Figure 2). Mechanical building equipment (e.g., heating, ventilation and air conditioning systems) can result in noise levels of approximately 90 dBA at 3 feet from the source. However, mechanical equipment systems are typically shielded from direct public exposure and housed on rooftops, within equipment rooms, or within exterior enclosures.

Based on preliminary site plans prepared for the project, the nearest existing residential land use is located approximately 350 feet from the project site. Based on this distance and assuming an uninterrupted noise level of 90 dBA L_{eq} at 3 feet, predicted operational noise levels associated with on-site building mechanical equipment would approximately 48 dBA L_{eq} at this nearest residence. Operational noise levels would be limited primarily to the daytime hours of school operations and would be intermittent. Given that building mechanical equipment is typically shielded from direct public exposure and placed on rooftops, actual noise levels would likely be substantially less. Based on preliminary site plans prepared for the project, operational noise levels for building mechanical equipment would not exceed the City/County of Fresno's daytime noise standard of 50 dBA L_{eq}. However, depending on final site design and building locations, predicted noise levels associated with building mechanical equipment could potentially exceed applicable noise standards.

It is also important to note that residential land uses are planned to be constructed along the northern and eastern project site boundaries. These future residential land uses would be located within the City of Fresno. Depending on final site design and building locations, predicted noise levels associated with building mechanical equipment could potentially exceed the City's daytime noise standard of 50 dBA L_{eq}. As a result, the operation of building mechanical equipment would be considered to have a ***potentially-significant*** impact to nearby existing and planned future residential land uses.

Table 10
Predicted Increases in Existing Traffic Noise Levels

Roadway Segment	Predicted Noise Level at 50 feet from Centerline of Near Travel Lane (dBA CNEL/L_{dn})[1]			
	Existing Without Project	Existing With Project	Difference[2]	Significant Increase?[3]
Clinton Avenue, Clovis Avenue to Fowler Avenue	63.3	63.4	0.1	No
Clinton Avenue, Fowler Avenue to Armstrong Avenue	59.4	60.2	0.8	No
Fowler Avenue, South of Clinton Avenue	65.1	66.4	1.3	No

1. Traffic noise levels were calculated using the FHWA roadway noise prediction model (FHWA-RD-77-108), based on data obtained from the traffic analysis prepared for this project.
2. Difference in noise levels reflects the incremental increase attributable to the proposed project.
3. Significant increase is defined as an increase of 3 dBA, or greater.

Table 11
Predicted Increases in Future Cumulative Traffic Noise Levels

Roadway Segment	Predicted Noise Level at 50 feet from Centerline of Near Travel Lane (dBA CNEL/L_{dn})[1]			
	Future Without Project	Future With Project	Difference[2]	Significant Increase?[3]
Clinton Avenue, Clovis Avenue to Fowler Avenue	64.3	64.4	0.1	No
Clinton Avenue, Fowler Avenue to Armstrong Avenue	65.8	66.0	0.2	No
McKinley Avenue, Fowler Avenue to Armstrong Avenue	63.5	65.0	1.4	No
Fowler Avenue, South of Clinton Avenue	68.5	68.9	0.4	No

1. Traffic noise levels were calculated using the FHWA roadway noise prediction model (FHWA-RD-77-108) based on data obtained from the traffic analysis prepared for this project.
2. Difference in noise levels reflects the incremental increase attributable to the proposed project.
3. Significant increase is defined as an increase of 3 dBA, or greater.

Exterior Recreational-Use Facilities

The proposed project would likely include the construction of on-site recreational uses, such as ball fields and ball courts. Based on noise measurements conducted for similar projects, average-hourly noise levels associated with elementary school recreational-use facilities, including ball fields and ball courts, typically average 60 dBA L_{eq}, or less, at the field edge and at approximately 50 feet from spectator areas. Intermittent noise events typically associated with such uses include individuals yelling and the intermittent sound of the hitting and bouncing of balls. Major competitive events involving large spectator crowds and the use of amplified sound/public address (PA) systems are typically not associated with elementary school facilities.

Based on preliminary site plans prepared for the proposed project, the nearest existing residential land use is located approximately 350 feet from the project site. Based on this distance and assuming an uninterrupted noise level of 60 dBA L_{eq} at 50 feet from the site boundary, predicted noise levels associated with on-site recreational uses would be approximately 43 dBA L_{eq} at the nearest residential land use. Operational noise levels would be limited primarily to the daytime hours of school operations and would be intermittent. Assuming that recreational activities were to occur continuously during the daytime hours, predicted average-daily noise levels at the nearest residential land use would be approximately 41 dBA CNEL, or less. Operational noise levels for on-site recreational uses would not exceed the City of Fresno's average-daily noise standard of 60 dBA CNEL. However, depending on final site design and the location of onsite recreational uses, predicted noise levels associated with onsite recreational uses could potentially exceed applicable noise standards.

It is also important to note that residential land uses are planned to be constructed along the northern and eastern project site boundaries. These future residential land uses would be located within the City of Fresno. Depending on final site design and the location of onsite recreational uses, predicted noise levels associated with onsite recreational uses could potentially exceed the City's average-daily noise standard of 60 dBA CNEL. As a result, onsite recreational uses would be considered to have a ***potentially-significant*** impact to nearby existing and future planned residential land uses.

On-site Vehicle Parking Areas

Noise levels commonly associated with parking lots are generated by the starting of vehicles, the opening and closing of vehicle doors, playing of amplified music, and the occasional sound of vehicle alarms and horns. Intermittent noise levels associated with such noise events can generate sound levels of up to approximately 92 dBA at 50 feet. Overall, average-hourly noise levels associated with parking lots are largely dependent on vehicle activity and, thus, would likely be greatest during the hours preceding or upon conclusion of school operations.

Based on a similar-sized elementary school site, the proposed project is anticipated to require approximately 125 on-site parking spaces. Assuming that all proposed vehicle parking spaces would be accessed within a one-hour period, the highest daytime hourly noise levels associated with on-site parking activities would be approximately 56 dBA L_{eq} at 50 feet. Based on this noise level and assuming that on-site parking facilities were to be located along the western property line, the highest predicted operational noise levels at the nearest residential land use would be approximately 35 dBA L_{eq}. Based on the preliminary site plans prepared for the proposed project, predicted noise levels associated with on-site vehicle parking areas would not exceed the City/County of Fresno's daytime noise standard of 50 dBA L_{eq}. However, depending on final site design, predicted noise levels associated with onsite parking areas could potentially exceed applicable noise standards and nearby existing and/or planned future residential land uses. As a result, this impact is considered ***potentially significant***.

Facility Maintenance

Exterior noise events associated with the maintenance of school facilities are typically associated with the operation of landscape maintenance equipment, as well as, occasional waste-collection activities. Based on measurements conducted at similar facilities, landscape maintenance equipment, such as leaf blowers and gasoline-powered lawn mowers; as well as waste collection activities can result in intermittent noise levels of up to approximately 100 dBA at 3 feet (EPA 1971). Resultant exterior noise levels could reach intermittent levels of approximately 75 dBA at 50 feet. Based on this noise level and assuming that facility maintenance activities were to occur near the site boundary, predicted intermittent noise levels at the nearest residential land use would be approximately 58 dBA L_{max}. The hours during which landscape maintenance and waste collection activities would be conducted have not yet been specified, nor has the location of on-site waste-collection facilities been identified. In the event that landscape maintenance and waste collection activities were to occur during the more noise-sensitive nighttime hours, the intermittent noise levels associated with these activities could result in increased levels of annoyance and potential sleep disruption to occupants of nearby residential dwellings. As a result, increases in noise levels associated with facility maintenance activities would be considered ***potentially significant***.

Mitigation Measure Noise-2: The following measures shall be implemented to reduce long-term operational noise impacts:

- An acoustical analysis shall be prepared for the proposed project prior to final design. The acoustical analysis shall identify noise-reduction measures to be incorporated sufficient to achieve an exterior average-hourly noise-level of 50 dBA L_{eq}, or less, at the property line of the nearest noise-sensitive land use for on-site building mechanical equipment and vehicle parking areas. Onsite recreational uses shall be evaluated in comparison to the City of Fresno's average-daily noise standard of 60 dBA CNEL. Noise-reduction measures to be incorporated may include, but are not limited to, the selection of alternative or quieter equipment and construction of noise barriers (i.e., walls).
- Noise-generating maintenance activities, such as landscape maintenance and waste-collection activities, shall be limited to between the hours of 7:00 a.m. to 10:00 p.m.

  Timing/Implementation: During Operation
  Enforcement/Monitoring: Clovis Unified School District

Significance After Mitigation: Implementation of the above mitigation measures would limit on-site maintenance activities to the daytime hours of operation. Predicted noise levels associated with facility maintenance activities would not exceed the City of Fresno's daytime noise standards of 50 dBA L_{eq} or 70 dBA L_{max}. An acoustical analysis would also be required, prior to final site design, to further evaluate noise levels associated with on-site non-transportation noise sources and to incorporate additional mitigation sufficient to achieve applicable noise standards. As a result, increases in noise levels associated with facility maintenance activities would be considered ***less than significant***.

Impact Noise-D	***Would the project result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?***

Construction noise typically occurs intermittently and varies depending upon the nature or phase (e.g., demolition/land clearing, grading and excavation, erection) of construction. Noise generated by construction equipment, including earth movers, material handlers, and portable generators, can reach high levels. Although noise ranges were found to be similar for all construction phases, the initial site preparation phase tended to involve the most equipment. As noted in Table 12, noise levels generated by individual pieces of construction equipment typically range from approximately 74 dBA to 89 dBA L_{max} at 50 feet (FTA 2006). Typical operating cycles may involve 2 minutes of full power, followed by 3 or 4 minutes at lower settings. Average hourly noise levels at construction sites typically range from approximately 65 to 89 dBA L_{eq} at 50 feet, depending on the activities performed.

Based on the equipment noise levels presented in Table 12 and assuming a noise attenuation rate of 6 dBA per doubling of distance from the source, exterior noise levels at nearby residences located within approximately 1,500 feet and within line-of-sight of construction activities could exceed 60 dBA without feasible noise control. Activities occurring during the more noise-sensitive nighttime hours would be of particular concern given the potential for increased levels of annoyance and sleep disruption to occupants of nearby residential dwellings.

The proposed project does not include hourly restrictions for construction activities. Typically, construction-related activities occurring during the nighttime hours (i.e., 10:00 p.m. to 7:00 a.m.) would not be exempt from noise ordinance requirements. As a result, given that construction activities could potentially occur during the more noise-sensitive periods of the day, noise-generating construction activities would be considered to have a ***potentially significant*** short-term noise impact.

Table 12
Typical Construction Equipment Noise Levels

Equipment	Typical Noise Level (dBA L_{max}) 50 feet from Source
Air Compressor	81
Backhoe	80
Compactor	82
Concrete Mixer	85
Concrete Vibrator	76
Crane, Mobile	83
Dozer	85
Generator	81
Grader	85
Impact Wrench	85
Jack Hammer	88
Loader	85
Truck	88
Paver	89
Pneumatic Tool	85
Roller	74
Saw	76
Sources: FTA 2006	

Mitigation Measure Noise-3: The following measures shall be implemented to reduce construction-generated noise levels:

a. Construction activities (excluding activities that would result in a safety concern to the public or construction workers) shall be limited to between the hours of 7:00 a.m. and 10:00 p.m. Construction activities shall be prohibited on Sundays and legal holidays.
b. Construction equipment shall be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturers' recommendations. Equipment engine shrouds shall be closed during equipment operation.
c. When not in use, all equipment shall be turned off and shall not be allowed to idle. Provide clear signage that posts this requirement for workers at the entrances to the site.

Timing/Implementation: *Prior to and During Construction*
Enforcement/Monitoring: *Clovis Unified School District*

Significance After Mitigation: Use of mufflers would reduce individual equipment noise levels by approximately 10 dBA. Implementation of the above mitigation measures would limit construction activities to the less noise-sensitive periods of the day. With implementation of the above mitigation measures, this impact would be considered ***less than significant***.

Impact Noise-E	***For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels? or*** ***For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?***

The nearest airport in the project vicinity is the Fresno Yosemite International Airport, which is located approximately one mile west of the project site. The proposed project is not located within the projected 60 dBA CNEL/L_{dn} noise contour of this airport (City of Fresno 2014). No private airstrips were identified within two miles of the project site. Implementation of the proposed project would not result in the exposure of sensitive receptors to aircraft noise levels nor would the proposed project affect airport operations. This impact is considered ***less than significant***.

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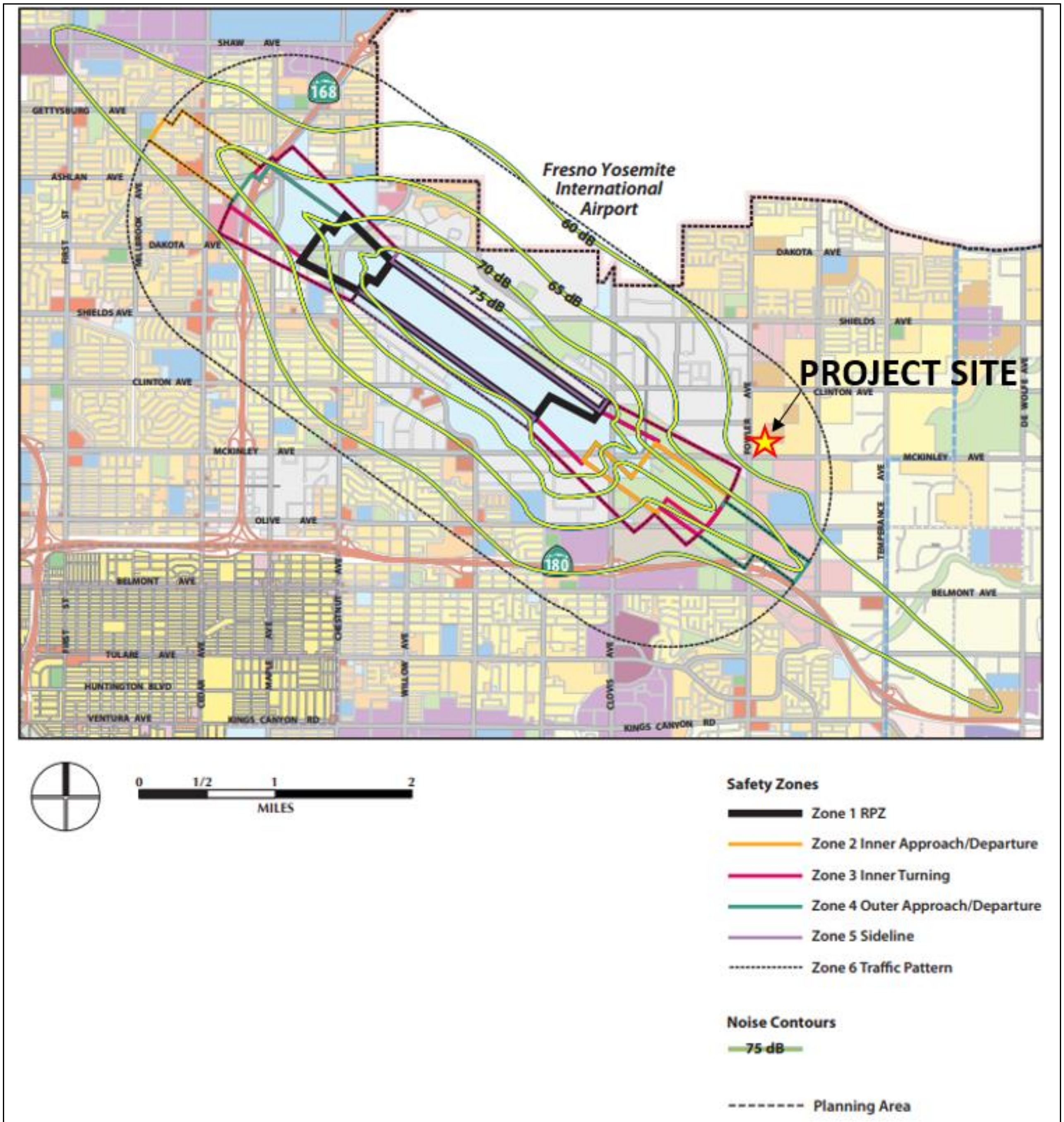
APPENDIX A
Noise Prediction Modeling & Supportive Documentation



Source: City of Fresno 2014

TRAFFIC NOISE MODELING

ROADWAY SEGMENT	EXISTING CONDITIONS							EXISTING PLUS PROJECT CONDITIONS								
	ADT	LANES	SPEED	CNEL AT 75' FROM RCL	DISTANCE TO CNEL CONTOURS (FEET)			ADT	LANES	SPEED	CNEL AT 75' FROM RCL	DISTANCE TO CNEL CONTOURS (FEET)			CHANGE IN NOISE LEVELS AT 75' FROM RCL	EXCEEDS STANDARD?
					70	65	60					70	65	60		
CLINTON AVE, CLOVIS AVE TO FOWLER AVE	5494	2	45	63.25	0	50.6	158.8	5724	2	45	63.4	0	52.6	165.5	0.15	NO
CLINTON AVE, FOWLER AVE TO ARMSTRONG AVE	2251	2	45	59.38	0	0	65.3	2701	2	45	60.2	0	0	78.3	0.82	NO
MCKINLEY AVE, FOWLER AVE TO ARMSTRONG AVE.	NA	NA	NA	0	0	0	0	2310	2	45	59.5	0	0	67		
FOWLER AVE., SOUTH OF CLINTON AVE.	8330	2	45	65.1	0	76.3	240.7	11250	2	45	66.4	0	103	325.1	1.3	NO

ROADWAY SEGMENT	FUTURE CUMULATIVE CONDITIONS							FUTURE CUMULATIVE PLUS PROJECT CONDITIONS								
	ADT	LANES	SPEED	CNEL AT 75' FROM RCL	DISTANCE TO CNEL CONTOURS (FEET)			ADT	LANES	SPEED	CNEL AT 75' FROM RCL	DISTANCE TO CNEL CONTOURS (FEET)			CHANGE IN NOISE LEVELS AT 75' FROM RCL	EXCEEDS STANDARD?
					70	65	60					70	65	60		
CLINTON AVE, CLOVIS AVE TO FOWLER AVE	6910	2	45	64.25	0	63.4	199.7	7110	2	45	64.37	0	65.2	205.5	0.12	NO
CLINTON AVE, FOWLER AVE TO ARMSTRONG AVE	9850	2	45	65.79	0	90.2	284.6	10250	2	45	65.96	0	93.8	296.2	0.17	NO
MCKINLEY AVE, FOWLER AVE TO ARMSTRONG AVE.	5870	NA	NA	63.54	0	54	169.7	8130	2	45	64.95	0	74.5	235	1.41	NO
FOWLER AVE., SOUTH OF CLINTON AVE.	18250	2	45	68.5	53.1	166.8	527.2	19905	2	45	68.9	57.8	181.9	575	0.4	NO

NA=McKinley Avenue from Fowler to Armstrong does not currently exist.

Traffic volumes for Fowler Avenue assume peak-hour volumes are approximately 10 percent of ADT.

MODEL CALIBRATION

SEGMENT	CLINTON, CLOVIS TO FOWLER
MEASURED	65.1
MODELED	66.5
DIFFERENCE	1.4
ACCEPTABLE?	YES

SEGMENT	FOWLER, S OF CLINTON
MEASURED	67.2
MODELED	68
DIFFERENCE	0.8
ACCEPTABLE?	YES

Appendix 6

Traffic Impact Analysis

Draft Traffic Impact Analysis

Clovis Unified School District
Fowler-McKinley Elementary School

Located at the Northeast Corner of Fowler Avenue and the McKinley Avenue Alignment

In the City of Fresno, California

Prepared for:

Odell Planning & Research, Inc.
49346 Road 426, Suite 2
Oakhurst, CA 93644

June 15, 2018

Project No. 004-059

JLB Traffic Engineering, Inc.

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JLB Traffic Engineering, Inc.

Traffic Engineering, Transportation Planning, & Parking Solutions

Draft Traffic Impact Analysis

For the Clovis Unified School District Fowler-McKinley Elementary School located at the northeast corner of Fowler Avenue and the McKinley Avenue Alignment

In the City of Fresno, CA

June 15, 2018

This Draft Technical Letter has been prepared under the direction of a licensed Traffic Engineer. The licensed Traffic Engineer attests to the technical information contained therein and has judged the qualifications of any technical specialists providing engineering data from which recommendations, conclusions, and decisions are based.

Prepared by:

____

Jose Luis Benavides, PE, TE

President

REGISTERED PROFESSIONAL ENGINEER
JOSE LUIS BENAVIDES
No.T 2328
Exp:06/30/19
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STATE OF CALIFORNIA

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Introduction and Summary

Introduction

This report describes a Traffic Impact Analysis (TIA) prepared by JLB Traffic Engineering, Inc. (JLB) for the Clovis Unified School District (CUSD) Fowler-McKinley Elementary School (Project) located at the northeast corner of Fowler Avenue and the McKinley Avenue alignment in the County of Fresno. The Project proposes to build an Elementary School with approximately 28 classrooms, administrative offices, a multi-purpose building, hardcourt areas and athletic fields that could potentially be lighted. The Project is estimated to serve up to 750 students in kindergarten through sixth grades. Although the Project is located in the County of Fresno, it includes annexation to the City of Fresno. Therefore, off-site improvements are proposed to follow City of Fresno standards. Timing for construction of the Project is dependent on enrollment growth and funding availability, but the CUSD estimates that the school could be constructed in approximately five years.

The purpose of this TIA is to evaluate the potential on-site and off-site traffic impacts, identify short-term roadway and circulation needs, determine potential mitigation measures, and identify any critical traffic issues that should be addressed in the on-going planning process. The study primarily focused on evaluating traffic conditions at intersections and segments that may be impacted by the proposed Project. The scope of work was prepared via consultation with City of Fresno, County of Fresno and Caltrans staff.

Summary

The potential traffic impacts of the proposed Project were evaluated in accordance with the standards set forth by the level of service (LOS) policy of the City of Fresno, County of Fresno and Caltrans.

Existing Traffic Conditions

- At present, all study intersections operate at an acceptable LOS. However, the intersection of Olive Avenue and Fowler Avenue is operating at LOS F during both peak periods. While the City of Fresno has made the appropriate findings to designate LOS F as the criteria of significance for Fowler Avenue between McKinley Avenue and Olive Avenue, it did so under the assumption that up to four through lanes would be built on Fowler Avenue. To improve the LOS at this intersection, it is recommended that the following improvements, which are included within the City of Fresno Traffic Signal Mitigation Impact (TSMI) fee, be implemented.
    - Olive Avenue and Fowler Avenue
        - Add a northbound left-turn lane;
        - Modify the northbound left-through-right lane to a through-right lane;
        - Add a southbound left-turn lane;
        - Modify the southbound left-through-right lane to a through-right lane;
        - Signalize the intersection with protective left-turn phasing in all directions; and
        - Modify the intersection to accommodate the added lanes.
- At present, all study segments operate at an acceptable LOS.

Existing plus Project Traffic Conditions

- It is recommended that the CUSD coordinate with the City of Fresno on the ultimate placement of the future Project driveways to ensure that the location of the proposed access points relative to the existing local roads and driveways in the Project's vicinity are located at points that minimize traffic operational impacts to the roadway network.
- It is recommended that the Project incorporate the recommendations presented in more detail within the Queuing Analysis for the intersection of McKinley Avenue and Fowler Avenue.
- It is recommended that the Project implement a Class II Bike Lane along its frontage to Fowler Avenue.
- It is recommended that the Project conduct a warrant analysis for a hybrid beacon across Clinton Avenue at the future Laverne Avenue intersection prior to construction of the Project.
- At build-out, the proposed Project is estimated to generate a maximum of 1,418 daily trips, 503 AM peak hour trips and 128 PM peak hour trips.
- It is recommended that the CUSD work with the City of Fresno to implement a Safe Routes to School plan and seek grant funding to help build walkways where they are lacking within a two-mile radius of the Project site.
- Under this scenario, all study intersections and segments are projected to operate at an acceptable LOS.

Near Term plus Project Traffic Conditions

- The total trip generation for the Near Term Projects is 112,465 daily trips, 8,520 AM peak hour trips and 10,859 PM peak hour trips.
- Under this scenario, the intersections of McKinley Avenue and Fowler Avenue and Floradora Avenue and Fowler Avenue are projected to operate at LOS F during one or both peak periods. While the City of Fresno has made the appropriate findings to designate LOS F as the criteria of significance for Fowler Avenue between McKinley Avenue and Olive Avenue, it did so under the assumption that up to four through lanes would be built on Fowler Avenue. To improve the LOS at these intersections, it is recommended that the following improvements be implemented.
    - McKinley Avenue and Fowler Avenue
        - Modify the northbound through-right lane to a through lane;
        - Add a second northbound through lane with a receiving lane north of McKinley Avenue;
        - Add a northbound right-turn lane;
        - Add a southbound left-turn lane;
        - Modify the southbound left-through lane to a through lane;
        - Add a second southbound through lane with a receiving lane south of McKinley Avenue; and
        - Implement an all-way stop control.
    - Floradora Avenue and Fowler Avenue
        - Add a westbound left-turn lane;
        - Modify the westbound left-right lane to a right-turn lane;
        - Add a northbound through lane with a receiving lane north of Floradora Avenue;
        - Add a southbound left-turn lane;
        - Modify the southbound left-through lane to a through lane;

    - Add a second southbound through lane with a receiving lane south of Floradora Avenue; and
    - Modify the intersection to accommodate the added lanes.
- Under this scenario, all study segments are projected to operate at an acceptable LOS.
- Between the Existing Traffic Conditions and the Near Term plus Project Traffic Conditions scenarios, the Project accounts for 1.2 percent of the daily trips, 5.6 percent of the AM peak hour trips, and 1.2 percent of the PM peak hour trips of growth in traffic, while the rest can be attributable to the Near Term Projects. Therefore, one can deduce that the majority of the mitigation measures presented under this scenario may not be necessary immediately upon completion of the proposed Project.

Cumulative Year 2035 No Project Traffic Conditions

- Under this scenario, the intersections of McKinley Avenue and Fowler Avenue, Floradora Avenue and Fowler Avenue, and Olive Avenue and Fowler Avenue are projected to operate at LOS F during both peak periods. While the City of Fresno has made the appropriate findings to designate LOS F as the criteria of significance for Fowler Avenue between McKinley Avenue and Olive Avenue, it did so under the assumption that up to four through lanes would be built on Fowler Avenue. Therefore, to improve the LOS at these intersections, it is recommended that the following improvements be implemented.
  - McKinley Avenue and Fowler Avenue
    - Modify the eastbound through-right lane to a through lane;
    - Add an eastbound right-turn lane;
    - Modify the westbound through-right lane to a through lane;
    - Add a westbound right-turn lane;
    - Modify the northbound through-right lane to a through lane;
    - Add a second northbound through lane with a receiving lane north of McKinley Avenue;
    - Add a northbound right-turn lane;
    - Modify the southbound through-right lane to a through lane;
    - Add a second southbound through lane with a receiving lane south of McKinley Avenue;
    - Add a southbound right-turn lane;
    - Signalize the intersection with protective left-turn phasing in all directions;
    - Implement overlap phasing of the eastbound right-turn with the northbound left-turn phase; and
    - Prohibit northbound to southbound U-turns.
  - Floradora Avenue and Fowler Avenue
    - Add a northbound through lane with a receiving lane north of Floradora Avenue;
    - Add a southbound through lane with a receiving lane south of Floradora Avenue;
    - Install a two-lane roundabout (for northbound and southbound traffic); and
    - Modify the intersection to accommodate the added lanes.
  - Olive Avenue and Fowler Avenue
    - Add a second westbound left-turn lane;
    - Add a second northbound through lane with a receiving lane north of Olive Avenue;
    - Add a second southbound through lane with a receiving lane south of Olive Avenue; and
    - Modify the traffic signal to accommodate the added lanes.
- Under this scenario, all study segments are projected to operate at an acceptable LOS.

Cumulative Year 2035 plus Project Traffic Conditions

- Under this scenario, the intersection of Clinton Avenue and Fowler Avenue is projected to exceed its LOS threshold during the AM peak period. To improve the LOS at this intersection, it is recommended that the following improvements be implemented.
  - Clinton Avenue and Fowler Avenue
    - Add a second northbound through lane;
    - Modify the southbound right-turn lane to a through-right lane and add a receiving lane south of Clinton Avenue; and
    - Modify the traffic signal to accommodate the added lanes.
- In addition, the intersections of McKinley Avenue and Fowler Avenue, Floradora Avenue and Fowler Avenue, and Olive Avenue and Fowler Avenue are projected to operate at LOS F during both peak periods. While the City of Fresno has made the appropriate findings to designate LOS F as the criteria of significance for Fowler Avenue between McKinley Avenue and Olive Avenue, it did so under the assumption that up to four through lanes would be built on Fowler Avenue. Therefore, to improve the LOS at these intersections, it is recommended that the following improvements be implemented.
  - McKinley Avenue and Fowler Avenue
    - Modify the eastbound through-right lane to a through lane;
    - Add an eastbound right-turn lane;
    - Modify the westbound through-right lane to a through lane;
    - Add a westbound right-turn lane;
    - Modify the northbound through-right lane to a through lane;
    - Add a second northbound through lane with a receiving lane north of McKinley Avenue;
    - Add a northbound right-turn lane;
    - Modify the southbound through-right lane to a through lane;
    - Add a second southbound through lane with a receiving lane south of McKinley Avenue;
    - Add a southbound right-turn lane;
    - Signalize the intersection with protective left-turn phasing in all directions;
    - Implement overlap phasing of the eastbound right-turn with the northbound left-turn phase; and
    - Prohibit northbound to southbound U-turns.
  - Floradora Avenue and Fowler Avenue
    - Add a northbound through lane with a receiving lane north of Floradora Avenue;
    - Add a southbound through lane with a receiving lane south of Floradora Avenue;
    - Install a two-lane roundabout (for northbound and southbound traffic); and
    - Modify the intersection to accommodate the added lanes.
  - Olive Avenue and Fowler Avenue
    - Add a second westbound left-turn lane;
    - Add a second northbound through lane with a receiving lane north of Olive Avenue;
    - Add a second southbound through lane with a receiving lane south of Olive Avenue; and
    - Modify the traffic signal to accommodate the added lanes.

- Moreover, while the intersection of Kerry Avenue and Fowler Avenue is projected to operate at an acceptable LOS during both peak periods, it was modified due to its proximity to both Clinton Avenue and McKinley Avenue. Therefore, it is recommended that the following improvements be implemented.
    - Kerry Avenue and Fowler Avenue
        - Add a northbound through lane with a receiving lane north of Kerry Avenue;
        - Add a southbound through lane with a receiving lane south of Kerry Avenue; and
        - Modify the intersection to accommodate the added lanes.
- Under this scenario, all study segments are projected to operate at an acceptable LOS.

Queuing Analysis

- It is recommended that the City consider left-turn and right-turn lane storage lengths as indicated in Table XIII.

Project's Equitable Fair Share

- It is recommended that the Project contribute its equitable Fair Share as presented in Table XIV.

TIA Scope of Work

The study focused on evaluating traffic conditions at study intersections and segments that may potentially be impacted by the proposed Project. On March 14, 2018, a Draft Scope of Work for the preparation of a Traffic Impact Analysis for this Project was provided to the City of Fresno, County of Fresno and Caltrans for their review and comment. The Draft Scope of Work was based on communication with City of Fresno staff. Any comments to the Draft Scope of Work were to be provided by April 4, 2018.

On March 14, 2018, Caltrans approved the Draft Scope of Work as presented. On April 2, 2018, the County of Fresno responded to the Draft Scope of Work. The County of Fresno requested that the intersection of Floradora Avenue and Armstrong Avenue be included in the analysis along with the analysis of the segments of Clinton Avenue and Olive Avenue between Clovis Avenue and Temperance Avenue and McKinley Avenue and Floradora Avenue between Fowler Avenue and Armstrong Avenue. Based on the anticipated school boundary for the Project, JLB determined that the intersection of Floradora Avenue and Armstrong Avenue would not be impacted, especially since it would experience less than 10 peak hour Project trips. Furthermore, JLB determined that the segments of Clinton Avenue between Armstrong Avenue and Temperance Avenue, Floradora Avenue between Fowler Avenue and Temperance Avenue, McKinley Avenue between Armstrong Avenue and Temperance Avenue, and Olive Avenue between Clovis Avenue and Temperance Avenue would not be impacted either as these roadway segments would experience less than 100 Daily Project trips. On April 3, 2018, the City of Fresno responded to the Draft Scope of Work. The City of Fresno requested that the TIA analyze the typical PM peak period between 4 pm and 6 pm. In addition, the City of Fresno requested that the TIA include a qualitative analysis of the need for a High-intensity Activated crossWalK (HAWK) across McKinley Avenue. On April 27, 2018, the County of Fresno concurred with the City of Fresno's request to analyze the typical PM peak period.

Based on the comments received, this TIA includes the analysis of the segment of Clinton Avenue between Clovis Avenue and Armstrong Avenue as requested by the County of Fresno. Also, this TIA includes the analysis of the typical PM peak period between 4 pm and 6 pm and a qualitative HAWK analysis for future pedestrian crossings across the major streets as requested by the City of Fresno. The Draft Scope of Work and the comments received from the lead agency and responsible agencies are included in Appendix A.

Study Facilities

The existing peak hour turning movement and segment volume counts were conducted at the study intersections and segments in January, February and April 2018 while schools in the vicinity of the proposed Project were in session. The intersection turning movement counts included pedestrian volumes. The traffic counts for the existing study intersections and segments are contained in Appendix B.

Study Intersections

1. Clinton Avenue / Fowler Avenue
2. Kerry Avenue (future) / Fowler Avenue
3. McKinley Avenue (future) / Fowler Avenue
4. Floradora Avenue / Fowler Avenue
5. Olive Avenue / Fowler Avenue

Study Segments

1. Clinton Avenue between Clovis Avenue and Fowler Avenue
2. Clinton Avenue between Fowler Avenue and Armstrong Avenue
3. McKinley Avenue (future) between Fowler Avenue and Armstrong Avenue

Project Only Trips to State Facilities

1. State Route 180 / Fowler Avenue

Study Scenarios

Existing Traffic Conditions

This scenario evaluates the Existing Traffic Conditions based on existing traffic volumes and roadway conditions from traffic counts and field surveys conducted in the year 2018.

Existing plus Project Traffic Conditions

This scenario evaluates total traffic volumes and roadway conditions based on the Existing plus Project Traffic Conditions. The Existing plus Project traffic volumes were obtained by adding the 2018 Project Only Trips to the Existing Traffic Conditions scenario. The 2018 Project Only Trips to the study intersections were based on the anticipated school boundary, existing travel patterns, the existing roadway network, engineering judgment, residential and commercial densities, and the City of Fresno 2035 General Plan Circulation Element in the vicinity of the Project.

Near Term plus Project Traffic Conditions

This scenario evaluates total traffic volumes and roadway conditions based on the Near Term plus Project Traffic Conditions. The Near Term plus Project traffic volumes were obtained by adding the Near Term Projects' related trips to the Existing plus Project Traffic Conditions scenario.

Cumulative Year 2035 No Project Traffic Conditions

This scenario evaluates total traffic volumes and roadway conditions based on the Cumulative Year 2035 No Project Traffic Conditions. The Cumulative Year 2035 No Project traffic volumes were obtained by subtracting the 2035 Project Only Trips from the Cumulative Year 2035 plus Project Traffic Conditions scenario.

Cumulative Year 2035 plus Project Traffic Conditions

This scenario evaluates total traffic volumes and roadway conditions based on the Cumulative Year 2035 plus Project Traffic Conditions. The Cumulative Year 2035 plus Project traffic volumes were obtained from the Fresno COG traffic model runs (Base Year 2018 and Cumulative Year 2035) and existing traffic counts. Under this scenario, the increment method, as recommended by the Model Steering Committee, was utilized to determine the Cumulative Year 2035 plus Project traffic volumes. The Fresno COG Models are contained in Appendix C. It should be noted that this study assumes that McKinley Avenue will exist west and east of Fowler Avenue by the year 2035 resulting in changes in travel patterns and volumes.

Level of Service Analysis Methodology

Level of Service (LOS) is a qualitative index of the performance of an element of the transportation system. LOS is a rating scale running from "A" to "F", with "A" indicating no congestion of any kind and "F" indicating unacceptable congestion and delays. LOS in this study describes the operating conditions for signalized and unsignalized intersections.

The *2010 Highway Capacity Manual* (HCM) is the standard reference published by the Transportation Research Board and contains the specific criteria and methods to be used in assessing LOS. U-turn movements were analyzed using HCM 2000 methodologies and would yield more accurate results for the reason that HCM 2010 methodologies do not allow the analysis of U-turns. Synchro software was used to define LOS in this study. Details regarding these calculations are included in Appendix D.

A traffic impact is considered significant if it renders an unacceptable LOS on an intersection or roadway segment, or if it worsens an already unacceptable LOS condition on an intersection or roadway segment. At unsignalized intersections, a traffic impact would be considered "adverse but not significant" if the LOS standard is exceeded but the projected traffic does not satisfy traffic signal warrants. Under these conditions, the typical means to completely alleviate delays to stop-controlled vehicles would be to install a traffic signal. However, the unmet signal warrants would imply that the reduction in delay for the stop-controlled vehicles may not justify new delays that would be incurred by the major street traffic, which is currently not stopped. Under these circumstances, the installation of a traffic signal would not be recommended and the substandard LOS for stop-controlled vehicles would be considered an "adverse but not significant" impact.

Criteria of Significance

The 2035 City of Fresno General Plan has established various degrees of acceptable LOS on its major streets, which are dependent on four (4) Traffic Impact Zones (TIZ) within the City. The standard LOS threshold for TIZ I is LOS F, that for TIZ II is LOS E, that for TIZ III is LOS D, and that for TIZ IV is LOS E. Additionally, the 2035 MEIR made findings of overriding consideration to allow a lower LOS threshold than that established by the underlying TIZs. For those cases in which a LOS criterion for a roadway segment differs from that of the underlying TIZ, such criteria are identified in the roadway description. Pursuant to the City of Fresno 2035 General Plan, LOS D is used to evaluate the potential significance of LOS impacts to intersections and segments within this TIA.

The County of Fresno has established LOS C as the acceptable level of traffic congestion on county roads and streets that fall entirely outside the Sphere of Influence (SOI) of a City. For those areas that fall within the SOI of a City, the LOS criteria of the City are the criteria of significance used in this report. LOS C is used to evaluate the potential significance of LOS impacts to Fresno County intersections and segments, which fall outside the City of Fresno SOI. In this case, since all study facilities fall within the City of Fresno SOI, the City of Fresno LOS threshold is utilized.

Caltrans endeavors to maintain a target LOS at the transition between LOS C and D on State highway facilities consistent with the *Caltrans Guide for the Preparation of Traffic Impact Studies* dated December 2002. However, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS. In this TIA, however, since all study facilities fall within the City of Fresno, the City of Fresno LOS thresholds are utilized.

Operational Analysis Assumptions and Defaults

The following operational analysis values, assumptions and defaults were used in this study to ensure a consistent analysis of LOS among the various scenarios.

- Yellow time consistent with the California Manual of Uniform Traffic Control Devices (CA MUTCD) based on approach speeds
- Yellow time of 3.2 seconds for left-turn phases
- All-red clearance intervals of 1.0 second for all phases
- Walk intervals of 7.0 seconds
- Flashing Don't Walk based on 3.5 feet/second walking speed with yellow plus all-red clearance subtracted and 2.0 seconds added
- All new or modified signals utilize protective left-turn phasing
- A 3 percent heavy vehicle factor
- An average of 3 pedestrian calls per hour at signalized intersections
- The number of observed pedestrians at existing intersections was utilized under all study scenarios
- At existing intersections, the observed approach Peak Hour Factor (PHF) is utilized in the Existing Traffic Conditions scenario.
- For the Existing plus Project Traffic Conditions and Near Term plus Project Traffic Conditions scenarios, the following PHFs were used to take into account the peaking effects anticipated to be caused by the Project.
  - For the intersections of Clinton Avenue and Fowler Avenue, Kerry Avenue and Fowler Avenue and McKinley Avenue and Fowler Avenue, a PHF of 0.86 was utilized in the AM peak and a PHF of 0.90 was utilized in the PM peak.
  - For the intersections of Floradora Avenue and Fowler Avenue and Olive Avenue and Fowler Avenue, the existing PHFs were utilized.
- A PHF of 0.92, or the existing PHF if higher, is utilized in the Cumulative Year 2035 No Project Traffic Conditions scenario.
- For the Cumulative Year 2035 plus Project Traffic Conditions scenario, the following PHFs were used to reflect school traffic operations and an increase in future traffic volumes. As roadways start to reach their saturated flow rates, PHFs tend to increase to 0.90 or higher. The PHFs were established based on historical traffic counts collected by JLB for intersections in the proximity of school sites.
  - For the intersections of Clinton Avenue and Fowler Avenue, Kerry Avenue and Fowler Avenue and McKinley Avenue and Fowler Avenue, a PHF of 0.88 was utilized in the AM peak and a PHF of 0.90 was utilized in the PM peak.
  - For the intersections of Floradora Avenue and Fowler Avenue and Olive Avenue and Fowler Avenue, A PHF of 0.92, or the existing PHF if higher, is utilized.

Existing Traffic Conditions

Roadway Network

The Project site and surrounding study area are illustrated in Figure 1. Important roadways serving the Project are discussed below.

Clinton Avenue is an existing east-west two-lane, predominantly undivided collector adjacent to the proposed Project. In this area, Clinton Avenue is a two-lane undivided collector east of Clovis Avenue but is divided by a two-way left-turn lane for approximately 700 feet east of Clovis Avenue, 1,300 feet east of Fowler Avenue, and between Temperance Avenue and Locan Avenue. The City of Fresno 2035 General Plan Circulation Element designates Clinton Avenue as a four-lane collector between Clovis Avenue and Locan Avenue.

Fowler Avenue is an existing north-south two- to four-lane collector adjacent to the proposed Project. In this area, Fowler Avenue is a four-lane divided arterial north of Clinton Avenue, a two-lane undivided collector between Clinton Avenue and the State Route 180 Interchange, and a four-lane divided arterial south of the State Route 180 Interchange. Fowler Avenue extends south of the City of Clovis SOI and beyond the City of Fresno SOI. The City of Fresno 2035 General Plan Circulation Element designates Fowler Avenue as a four-lane divided arterial through the City of Fresno SOI. Furthermore, the City of Fresno 2035 General Plan Circulation Element acknowledged that Fowler Avenue would exceed LOS D as a four-lane facility between McKinley Avenue and Olive Avenue. However, City Council made the appropriate findings to designate LOS F as the criteria of significance for Fowler Avenue as a four-lane facility between McKinley Avenue and Olive Avenue.

McKinley Avenue is a planned future east-west two-lane collector adjacent to the proposed Project. McKinley Avenue exists as a four-lane divided arterial west of Clovis Avenue and a two-lane undivided arterial east of Temperance Avenue. In this area, McKinley Avenue will ultimately exist east of Fowler Avenue and extend northwest to connect to Sunnyside Avenue. The City of Fresno 2035 General Plan Circulation Element designates McKinley Avenue as a two-lane collector east of Sunnyside Avenue through the City of Fresno SOI.

Floradora Avenue is an existing east-west two-lane undivided local roadway in the vicinity of the proposed Project. In this area, Floradora Avenue extends between Fowler Avenue and Temperance Avenue. The City of Fresno 2035 General Plan Circulation Element designates Floradora Avenue as a local roadway throughout the City of Fresno.

Olive Avenue is an existing east-west two-lane collector in the vicinity of the proposed Project. In this area, Olive Avenue is an undivided collector west of Fowler Avenue and is divided by a two-way left-turn lane east of Fowler Avenue. This segment of Olive Avenue extends between the western limits of the City of Fresno SOI and Fancher Avenue in the City of Fresno. The City of Fresno 2035 General Plan Circulation Element designates Olive Avenue as a two-lane undivided collector between Grantland Avenue and Marks Avenue, a four-lane undivided collector between Marks Avenue and Fruit Avenue, a two-lane undivided collector between Fruit Avenue and Blackstone Avenue, a four-lane undivided collector between Blackstone Avenue and Temperance Avenue, and a two-lane undivided collector between Temperance Avenue and Fancher Avenue. The City of Fresno 2035 General Plan Circulation Element acknowledged that additional lanes would be necessary for Olive Avenue between Fulton Street and San Pablo Avenue by the year 2035. However, City Council made the appropriate findings to designate LOS E as the criteria of significance for this segment of Olive Avenue as a two-lane facility.

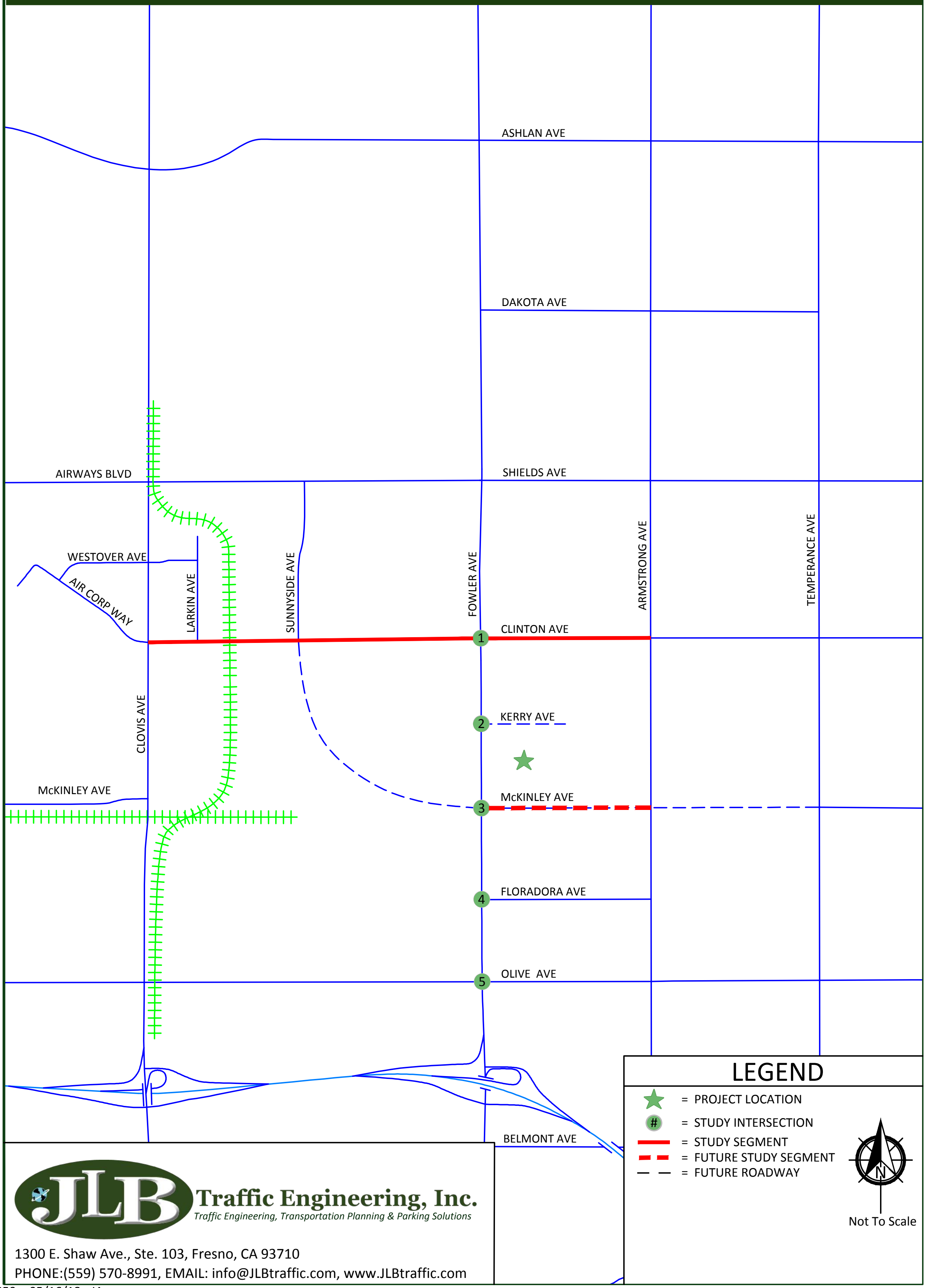
State Route 180 is an existing east-west six-lane freeway in the vicinity of the proposed Project. State Route 180 connects southeast and southwest Fresno with Downtown Fresno and has freeway-to-freeway interchanges at State Route 41, State Route 99 and State Route 168. East of Fresno, State Route 180 also provides access to Kings Canyon and Sequoia National Parks, while west of Fresno, State Route 180 connects to the cities of Kerman and Mendota.

Traffic Signal Warrants

Peak hour traffic signal warrants, as appropriate, were prepared for the unsignalized intersections in the Existing Traffic Conditions scenario. These warrants are found in Appendix J. The effects of right-turning traffic from the minor approach onto the major approach were taken into account using engineering judgement pursuant to the CA MUTCD guidelines for the preparation of traffic signal warrants. Under this scenario, the intersection of Olive Avenue and Fowler Avenue satisfies the peak hour signal warrant during both peak periods. Based on the signal warrants and engineering judgement, signalization of the intersection of Olive Avenue and Fowler Avenue is recommended.

CUSD Fowler-McKinley Elementary School
Vicinity Map

Figure 1



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Results of Existing Level of Service Analysis

Figure 2 illustrates the Existing turning movement volumes, intersection geometrics and traffic controls. LOS worksheets for the Existing Traffic Conditions scenario are provided in Appendix E. Table I presents a summary of the Existing peak hour LOS at the study intersections, while Table II presents a summary of the Existing LOS for the study segments.

At present, all study intersections operate at an acceptable LOS. However, the intersection of Olive Avenue and Fowler Avenue is operating at LOS F during both peak periods. While the City of Fresno has made the appropriate findings to designate LOS F as the criteria of significance for Fowler Avenue between McKinley Avenue and Olive Avenue, it did so under the assumption that up to four through lanes would be built on Fowler Avenue. To improve the LOS at this intersection, it is recommended that the following improvements, which are included within the City of Fresno Traffic Signal Mitigation Impact (TSMI) fee, be implemented.

- Olive Avenue and Fowler Avenue
  - Add a northbound left-turn lane;
  - Modify the northbound left-through-right lane to a through-right lane;
  - Add a southbound left-turn lane;
  - Modify the southbound left-through-right lane to a through-right lane;
  - Signalize the intersection with protective left-turn phasing in all directions; and
  - Modify the intersection to accommodate the added lanes.

At present, all study segments operate at an acceptable LOS.

Table I: Existing Intersection LOS Results

ID	Intersection	Intersection Control	(7-9) AM Peak Hour		(4-6) PM Peak Hour	
			Average Delay (sec/veh)	LOS	Average Delay (sec/veh)	LOS
1	Clinton Avenue / Fowler Avenue	Signalized	16.3	B	17.8	B
2	Kerry Avenue / Fowler Avenue	Does Not Exist	N/A	N/A	N/A	N/A
3	McKinley Avenue / Fowler Avenue	Does Not Exist	N/A	N/A	N/A	N/A
4	Floradora Avenue / Fowler Avenue	All-Way Stop	12.5	B	15.3	C
5	Olive Avenue / Fowler Avenue	All-Way Stop	**68.5**	**F**	**82.4**	**F**
		Signalized (Improved)	27.9	C	21.3	C

Note: LOS = Level of Service based on average delay on signalized intersections and All-Way STOP Controls
LOS for two-way and one-way STOP controlled intersections are based on the worst approach/movement of the minor street.

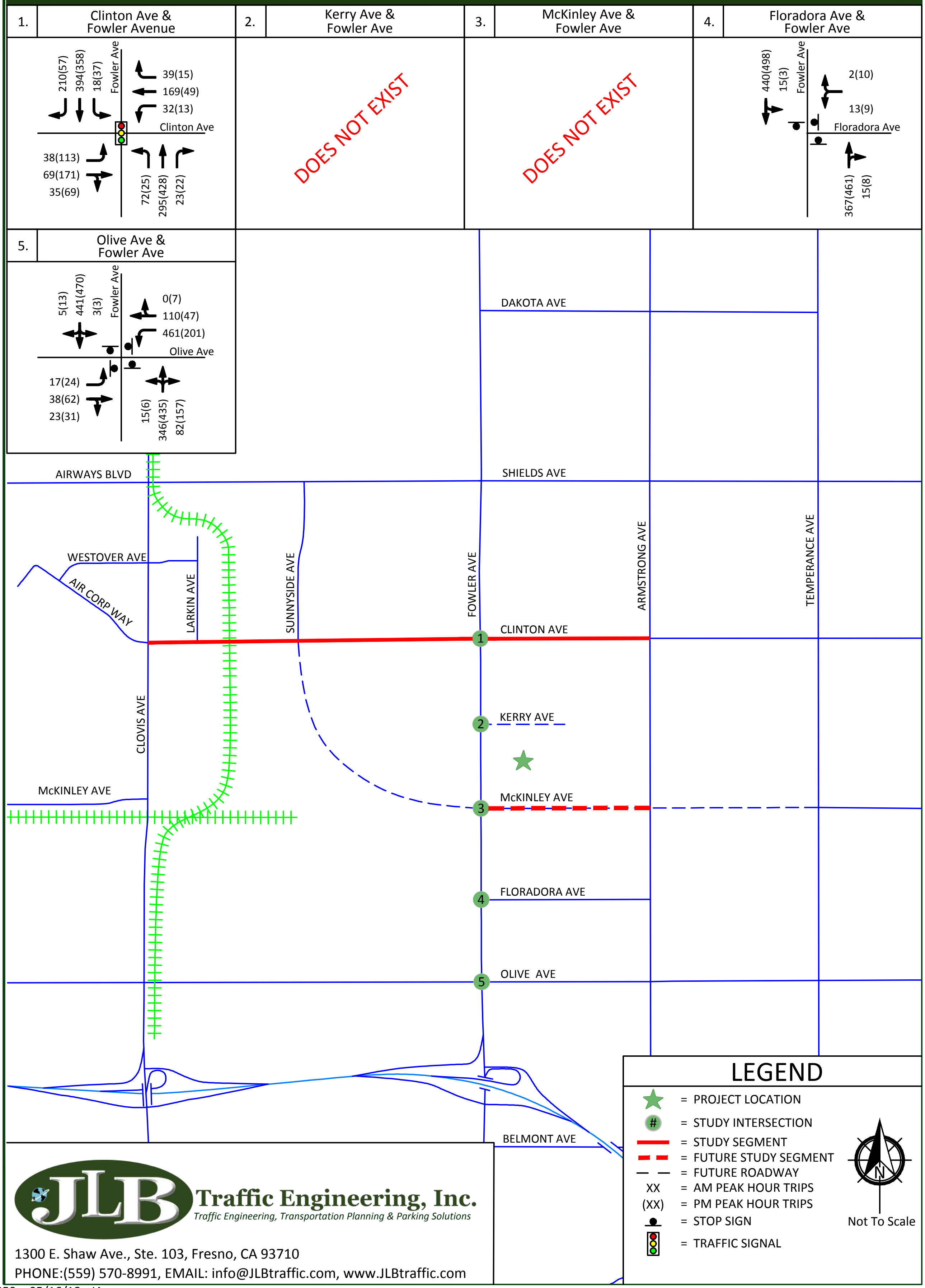
Table II: Existing Segment LOS Results

ID	Segment	Limits	Lanes	24-hour Volume	LOS
1	Clinton Avenue	Clovis Avenue and Fowler Avenue	2	5,494	C
2	Clinton Avenue	Fowler Avenue and Armstrong Avenue	2	2,251	B
3	McKinley Avenue	Fowler Avenue and Armstrong Avenue	N/A	N/A	N/A

Note: LOS = Level of Service per the Florida Roadway Segment LOS Tables

CUSD Fowler-McKinley Elementary School
Existing - Traffic Volumes, Geometrics and Controls

Figure 2



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Existing plus Project Traffic Conditions

Project Description

The Project proposes to construct a Clovis Unified School District (CUSD) Fowler-McKinley Elementary School (Project) located at the northeast corner of Fowler Avenue and the McKinley Avenue alignment in the County of Fresno. The Project proposes to build an Elementary School with approximately 28 classrooms, administrative offices, a multi-purpose building, hardcourt areas and athletic fields that could potentially be lighted. The Project is estimated to serve up to 750 students in kindergarten through sixth grades. Although the Project is located in the County of Fresno, it includes annexation to the City of Fresno. Therefore, off-site improvements are proposed to follow City of Fresno standards. Timing for construction of the Project is dependent on enrollment growth and funding availability, but the CUSD estimates that the school could be constructed in approximately five years.

Project Access

Based on information provided to JLB, access to and from the Project site will be primarily from two (2) roadways. One of the proposed roadways is the future Kerry Avenue while the other is the future McKinley Avenue. It is worth noting that both of these proposed access points would likely only connect to Fowler Avenue under the Existing plus Project and Near Term plus Project scenarios. Furthermore, while access to the Project site from Kerry Avenue is proposed as a full access, access to Kerry Avenue from Fowler Avenue will be limited to a left-in, right-in, and right-out access only. By the Cumulative Year 2035 plus Project scenario, it is anticipated that McKinley Avenue will exist west and east of Fowler Avenue, and thus connect to Armstrong Avenue. Since a Project Site Plan is currently not available, it is recommended that the CUSD coordinate with the City of Fresno on the ultimate placement of the future Project driveways to ensure that the location of the proposed access points relative to the existing local roads and driveways in the Project's vicinity are located at points that minimize traffic operational impacts to the roadway network.

JLB analyzed the conceptual roadways adjacent to the Project. Based on this review, it is recommended that the Project incorporate the recommendations presented in more detail within the Queuing Analysis for the intersection of McKinley Avenue and Fowler Avenue. By incorporating the recommendations presented in the Queuing Analyses, off-site traffic operations and circulation would be improved to acceptable levels.

Bikeways

Currently, bike lanes exist in the vicinity of the proposed Project site along Clinton Avenue and Fowler Avenue. The City of Fresno "Bicycle, Pedestrian & Trails Master Plan" recommends that Class II Bike Lanes be implemented on: 1) Clinton Avenue between Clovis Avenue and Locan Avenue, 2) Fowler Avenue south of Clinton Avenue, and 3) Olive Avenue between the western limits of the City of Fresno SOI and Fancher Avenue in the City of Fresno. The City of Fresno "Bicycle, Pedestrian & Trails Master Plan" also recommends that a Class I Bike Path be implemented along the canal bank adjacent to the McKinley Avenue alignment east of Clovis Avenue. Therefore, it is recommended that the Project implement a Class II Bike Lane along its frontage to Fowler Avenue.

Transit

Fresno Area Express (FAX) is the transit operator in the City of Fresno. At present, there are no FAX transit routes that operate in the vicinity of the proposed Project. The closest is FAX Route 45, which runs on Princeton Avenue and Fowler Avenue, approximately 0.50 miles to the north of the proposed Project. Route 45 operates at 60-minute intervals on weekdays and weekends and its nearest stop to the Project site is located on the south side of Princeton Avenue approximately 150 feet west of Fowler Avenue. This route provides a direct connection to Palm Lakes Golf Course, Bullard High School, Gillis Library, Fresno High School, Fresno City College, Manchester Transit Center, Army Navy Reserve and the Shields/Fowler Industrial Park. Retention of the existing and expansion of future transit routes is dependent on transit ridership demand and available funding.

Walkways

Because schools attract pedestrian activity, it is at times recommended that a warrant analysis for hybrid beacons across the major streets between the residential areas and the schools be conducted. In this case, the area west of Fowler Avenue within the anticipated Project's attendance area boundary is zoned industrial and, as a result, little to no pedestrian activity is anticipated to cross Fowler Avenue adjacent to the Project. Additionally, to the south of the Project along the south side of the future McKinley Avenue runs an irrigation canal that will remain. Hence, this existing canal will act as a barrier, preventing pedestrian activity across McKinley Avenue. Also, to the east of the Project, residential development and local streets will border the Project up to the Project's anticipated eastern boundary located along the west side of Armstrong Avenue. Similarly, to the north of the Project, residential development, local streets and Clinton Avenue, a collector street, will surround the area. It is likely that some of the school children that live in the areas north of Clinton Avenue between Fowler Avenue and Armstrong Avenue will walk across Clinton Avenue and subsequently utilize the local streets planned as part of tract map 6214 to reach the Project. Therefore, it is recommended that the Project conduct a warrant analysis for a hybrid beacon across Clinton Avenue at the future Laverne Avenue intersection prior to construction of the Project.

Trip Generation

Trip generation rates for the proposed Project were obtained from the 10th Edition of the Trip Generation Manual published by the Institute of Transportation Engineers (ITE). Table III presents the trip generation for the proposed Project with trip generation rates for an Elementary School. At build-out, the proposed Project is estimated to generate a maximum of 1,418 daily trips, 503 AM peak hour trips and 128 PM peak hour trips.

Table III: Project Trip Generation

Land Use (ITE Code)	*Size*	*Unit*	*Daily*		*AM Peak Hour*						*PM Peak Hour*					
			Rate	*Total*	*Trip Rate*	*In %*	*Out %*	*In*	*Out*	*Total*	*Trip Rate*	*In %*	*Out %*	*In*	*Out*	*Total*
Elementary School (520)	750	students	1.89	1,418	0.67	54	46	272	231	503	0.17	48	52	61	67	128
Total Project Trips				**1,418**				**272**	**231**	**503**				**61**	**67**	**128**

Trip Distribution

The trip distribution assumptions were developed based on the anticipated school boundary, existing travel patterns, the existing roadway network, engineering judgment, residential and commercial densities, and the City of Fresno 2035 General Plan Circulation Element. Figure 3 illustrates the 2018 Project Only Trips to the study intersections.

Safe Routes to School

The most direct path to the Project site for students residing on the northwest quadrant of Shields Avenue and Fowler Avenue would be to head south toward Shields Avenue and proceed east along the north side of Shields Avenue toward the intersection of Shields Avenue and Fowler Avenue. The intersection of Shields Avenue and Fowler Avenue is signalized and contains marked crosswalks on the west, north and east legs – pedestrians are prohibited to cross on the south leg. Students will then cross Fowler Avenue and Shields Avenue and proceed south along the east side of Fowler Avenue toward the intersection of Princeton Avenue and Fowler Avenue. The intersection of Princeton Avenue and Fowler Avenue is signalized and contains marked crosswalks on all approaches. Students will then cross Princeton Avenue along the east side of Fowler Avenue and continue heading south towards the intersection of Clinton Avenue and Fowler Avenue. The intersection of Clinton Avenue and Fowler Avenue is signalized and contains marked crosswalks on all approaches. Students will then proceed to cross Clinton Avenue along the east side of Fowler Avenue and continue heading south toward the future intersection of Kerry Avenue and Fowler Avenue. The intersection of Kerry Avenue and Fowler Avenue is anticipated to be controlled by a one-way stop on Kerry Avenue and contain a marked crosswalk on the east leg. Students will then cross Kerry Avenue along the east side of Fowler Avenue and then proceed east along the south side of Kerry Avenue to reach a Project access.

The most direct path to the Project site for students residing on the northeast quadrant of Shields Avenue and Fowler would be to head toward the northeast corner of the intersection of Shields Avenue and Fowler Avenue. The intersection of Shields Avenue and Fowler Avenue is signalized and contains marked crosswalks on the west, north and east legs – pedestrians are prohibited to cross on the south leg. Students will then cross Shields Avenue and proceed south along the east side of Fowler Avenue toward the intersection of Princeton Avenue and Fowler Avenue. The intersection of Princeton Avenue and Fowler Avenue is signalized and contains marked crosswalks on all approaches. Students will then cross Princeton Avenue along the east side of Fowler Avenue and continue heading south towards the intersection of Clinton Avenue and Fowler Avenue. The intersection of Clinton Avenue and Fowler Avenue is signalized and contains marked crosswalks on all approaches. Students will then proceed to cross Clinton Avenue along the east side of Fowler Avenue and continue heading south toward the future intersection of Kerry Avenue and Fowler Avenue. The intersection of Kerry Avenue and Fowler Avenue is anticipated to be controlled by a one-way stop on Kerry Avenue and contain a marked crosswalk on the east leg. Students will then cross Kerry Avenue along the east side of Fowler Avenue and then proceed east along the south side of Kerry Avenue to reach a Project access.

The most direct path to the Project site for students residing on the northeast quadrant of Clinton Avenue and Fowler Avenue would be to head toward the northeast corner of the intersection of Clinton Avenue and Fowler Avenue. The intersection of Clinton Avenue and Fowler Avenue is signalized and contains marked crosswalks on all approaches. Students will then cross Clinton Avenue along the east side of Fowler Avenue and continue heading south toward the future intersection of Kerry Avenue and Fowler Avenue. The intersection of Kerry Avenue and Fowler Avenue is anticipated to be controlled by a one-way stop on Kerry Avenue and contain a marked crosswalk on the east leg. Students will then cross Kerry Avenue along the east side of Fowler Avenue and then proceed east along the south side of Kerry Avenue to reach a Project access.

The most direct path to the Project site for students residing on the southeast quadrant of Clinton Avenue and Fowler Avenue would be to head west toward Fowler Avenue. Students may then proceed to head south along the east side of Fowler Avenue toward the intersection of Kerry Avenue and Fowler Avenue. The intersection of Kerry Avenue and Fowler Avenue is anticipated to be controlled by a one-way stop on Kerry Avenue and contain a marked crosswalk on the east leg. Students will then cross Kerry Avenue along the east side of Fowler Avenue and then proceed east along the south side of Kerry Avenue to reach a Project access.

The most direct path for students residing in the area bounded by Fowler Avenue, Floradora Avenue and Armstrong Avenue would be to head south along the west side of Armstrong Avenue toward the intersection of Floradora Avenue and Armstrong Avenue. The intersection of Floradora Avenue and Armstrong Avenue is controlled by a two-way stop on Floradora Avenue and contains unmarked crosswalks on all approaches. Students would proceed to head west along the north side of Floradora Avenue toward the intersection of Floradora Avenue and Fowler Avenue. The intersection of Floradora Avenue and Fowler Avenue is controlled by an all-way stop and contains unmarked crosswalks on all approaches. Students may then proceed to head north along the east side of Fowler Avenue toward the future intersection of McKinley Avenue and Fowler Avenue. The intersection of McKinley Avenue and Fowler Avenue is anticipated to be controlled by a two-way stop on McKinley Avenue and contain marked crosswalks on all approaches. Students will then cross McKinley Avenue along the east side of Fowler Avenue and then proceed east along the north side of McKinley Avenue to reach a Project access.

The most direct path for students residing on the southwest quadrant of Olive Avenue and Fowler Avenue would be to head east along the south side of Olive Avenue toward the intersection of Olive Avenue and Fowler Avenue. The intersection of Olive Avenue and Fowler Avenue is controlled by an all-way stop and contains unmarked crosswalks on all approaches. Students will then cross Fowler Avenue and Olive Avenue and proceed north along the east side of Fowler Avenue toward the intersection of Floradora Avenue and Fowler Avenue. The intersection of Floradora Avenue and Fowler Avenue is controlled by an all-way stop and contains unmarked crosswalks on all approaches. Students may then proceed to head north along the east side of Fowler Avenue toward the future intersection of McKinley Avenue and Fowler Avenue. The intersection of McKinley Avenue and Fowler Avenue is anticipated to be controlled by a two-way stop on McKinley Avenue and contain marked crosswalks on all approaches. Students will then cross McKinley Avenue along the east side of Fowler Avenue and then proceed east along the north side of McKinley Avenue to reach a Project access.

The most direct path for students residing on the southeast quadrant of Belmont Avenue and Clovis Avenue would be to head east along the south side of Belmont Avenue toward the intersection of Belmont Avenue and Fowler Avenue. The intersection of Belmont Avenue and Fowler Avenue is signalized and contains marked crosswalks on all approaches. Students will then cross Fowler Avenue and Belmont Avenue and proceed head north along the east side of Fowler Avenue toward the intersection of Olive Avenue and Fowler Avenue. The intersection of Olive Avenue and Fowler Avenue is controlled by an all-way stop and contains unmarked crosswalks on all approaches. Students will then cross Fowler Avenue and Olive Avenue and proceed north along the east side of Fowler Avenue toward the intersection of Floradora Avenue and Fowler Avenue. The intersection of Floradora Avenue and Fowler Avenue is controlled by an all-way stop and contains unmarked crosswalks on all approaches. Students may then proceed to head north along the east side of Fowler Avenue toward the future intersection of McKinley Avenue and Fowler Avenue. The intersection of McKinley Avenue and Fowler Avenue is anticipated to be controlled by a two-way stop on McKinley Avenue and contain marked crosswalks on all approaches. Students will then cross McKinley Avenue along the east side of Fowler Avenue and then proceed east along the north side of McKinley Avenue to reach a Project access.

While some of the areas are well-developed with walkways and intersection controls, there are several exceptions. Therefore, it is recommended that the CUSD work with the City of Fresno to implement a Safe Routes to School plan and seek grant funding to help build walkways where they are lacking within a two-mile radius of the Project site.

Traffic Signal Warrants

Peak hour traffic signal warrants, as appropriate, were prepared for the unsignalized intersections in the Existing plus Project Traffic Conditions scenario. These warrants are found in Appendix J. The effects of right-turning traffic from the minor approach onto the major approach were taken into account using engineering judgement pursuant to the CA MUTCD guidelines for the preparation of traffic signal warrants. Under this scenario, the intersection of McKinley Avenue and Fowler Avenue satisfies the peak hour signal warrant during the AM peak period only. Based on the signal warrant and engineering judgement, signalization of the intersection of McKinley Avenue and Fowler Avenue is not recommended. It is worth noting that CA MUTCD states that "satisfaction of a signal warrant or warrants shall not in itself require the installation of a traffic signal." Therefore, it is recommended that prior to the installation of a traffic signal, investigation of CA MUTCD warrants 1, 4 and 7, as applicable, be conducted for the intersection of McKinley Avenue and Fowler Avenue. It is also recommended that the CUSD update the peak hour signal warrant for the intersection of McKinley Avenue and Fowler Avenue prior to construction of the Project.

Results of Existing plus Project Level of Service Analysis

The Existing plus Project Traffic Conditions scenario assumes that the existing roadway geometrics and traffic controls will remain in place with one exception. Based on communication with City of Fresno and County of Fresno staff, CMAQ funding to signalize the intersection of Olive Avenue and Fowler Avenue has recently been received. It is anticipated that this work will be completed by the year 2023. Signalization of the intersection of Olive Avenue and Fowler Avenue will include protective left-turn phasing in all directions and a left-turn lane, a through lane, and a right-turn lane on all approaches. Therefore, this scenario assumes that the intersection of Olive Avenue and Fowler Avenue is signalized with protective left-turn phasing in all directions.

Figure 4 illustrates the Existing plus Project turning movement volumes, intersection geometrics and traffic controls. LOS worksheets for the Existing plus Project Traffic Conditions scenario are provided in Appendix F. Table IV presents a summary of the Existing plus Project peak hour LOS at the study intersections, while Table V presents a summary of the Existing plus Project LOS for the study segments.

Under this scenario, all study intersections and segments are projected to operate at an acceptable LOS.

Table IV: Existing plus Project Intersection LOS Results

ID	*Intersection*	*Intersection Control*	*(7-9) AM Peak Hour*		*(4-6) PM Peak Hour*	
			Average Delay (sec/veh)	*LOS*	*Average Delay (sec/veh)*	*LOS*
1	Clinton Avenue / Fowler Avenue	Signalized	29.0	C	28.3	C
2	Kerry Avenue / Fowler Avenue	One-Way Stop	13.4	B	12.2	B
3	McKinley Avenue / Fowler Avenue	One-Way Stop	34.1	D	19.5	C
4	Floradora Avenue / Fowler Avenue	All-Way Stop	15.2	C	16.3	C
5	Olive Avenue / Fowler Avenue	Signalized	26.8	C	17.4	B

Note: LOS = Level of Service based on average delay on signalized intersections and All-Way STOP Controls
LOS for two-way and one-way STOP controlled intersections are based on the worst approach/movement of the minor street.

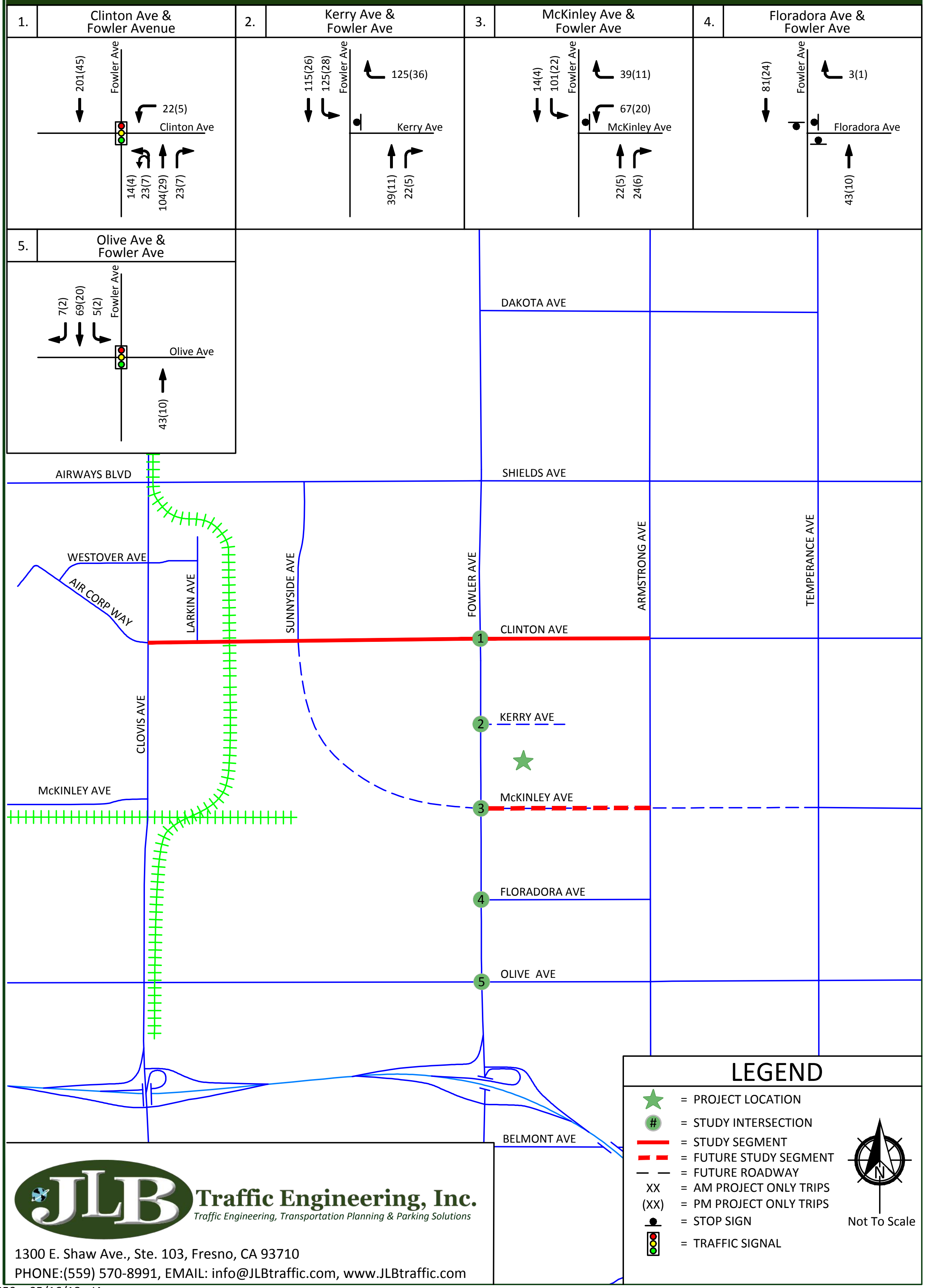
Table V: Existing plus Project Segment LOS Results

ID	*Segment*	*Limits*	*Lanes*	*24-hour Volume*	*LOS*
1	Clinton Avenue	Clovis Avenue and Fowler Avenue	2	5,724	C
2	Clinton Avenue	Fowler Avenue and Armstrong Avenue	2	2,701	B
3	McKinley Avenue	Fowler Avenue and Armstrong Avenue	2	2,310	B

Note: LOS = Level of Service per the Florida Roadway Segment LOS Tables

CUSD Fowler-McKinley Elementary School
2018 Project Only Trips

Figure 3



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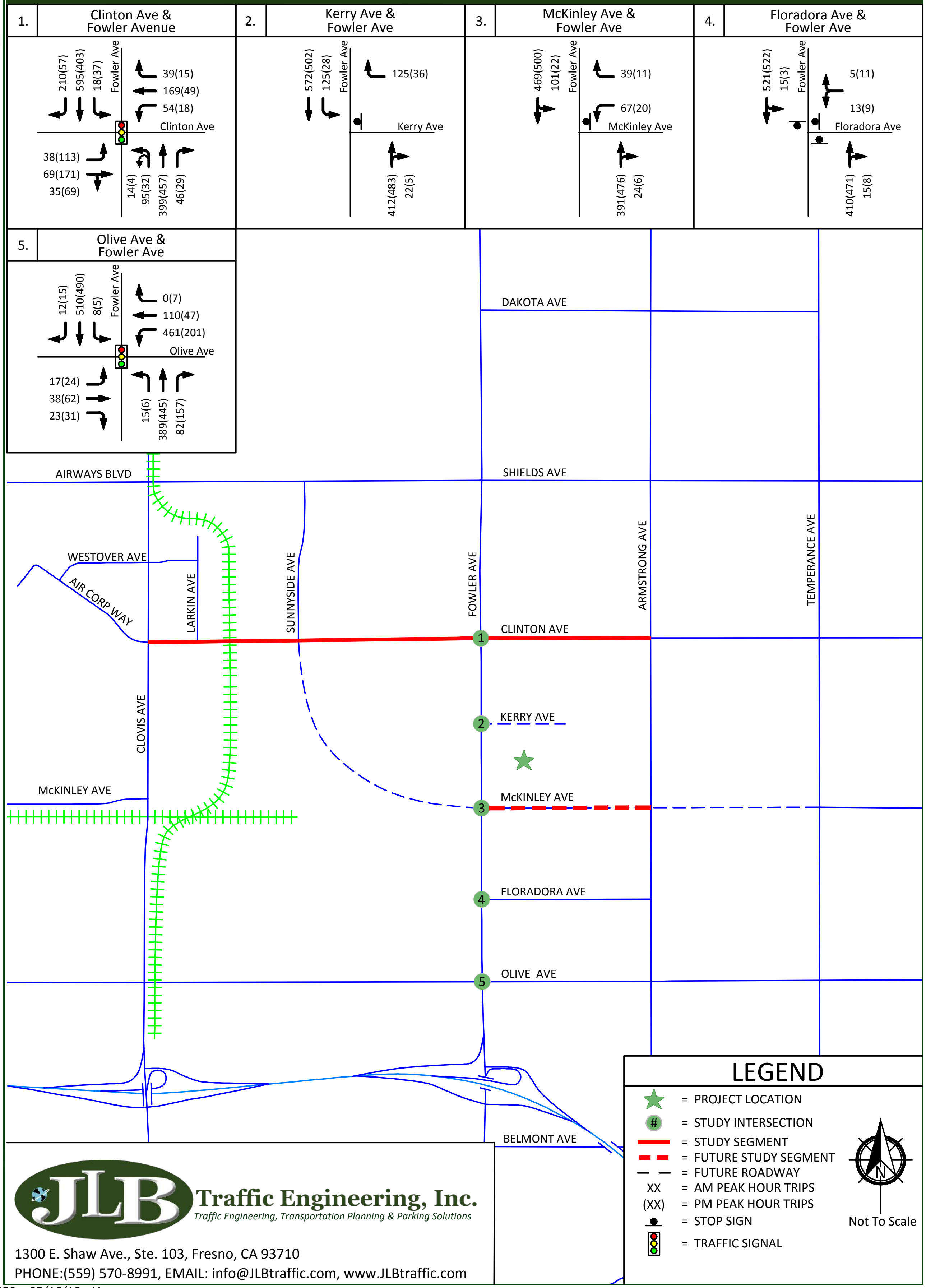
CUSD Fowler-McKinley Elementary School
Existing plus Project - Traffic Volumes, Geometrics and Controls

Figure 4



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Near Term plus Project Traffic Conditions

Description of Approved and Pipeline Projects

Approved and Pipeline Projects consist of developments that are either under construction, built but not fully occupied, are not built but have final site development review (SDR) approval, or for which the lead agency or responsible agencies have knowledge of. The City of Fresno, County of Fresno and Caltrans staff were consulted throughout the preparation of this TIA regarding approved and/or known projects that could potentially impact the study intersections. JLB staff conducted a reconnaissance of the surrounding area to confirm the Near Term Projects. Subsequently, it was agreed that the Near Term Projects listed in Table VI were approved, near approval, or in the pipeline within the proximity of the proposed Project.

The trip generation listed in Table VI is that which is anticipated to be added to the streets and highways by these Near Term Projects between the time of the preparation of this report and five years after buildout of the proposed Project. As shown in Table VI, the total trip generation for the Near Term Projects is 112,465 daily trips, 8,520 AM peak hour trips and 10,859 PM peak hour trips. Figure 5 illustrates the location of the approved, near approval, or pipeline projects and their combined trip assignment to the study intersections and segments under the Near Term plus Project Traffic Conditions scenario.

Table VI: Near Term Projects' Trip Generation

Approved Project Location	*Approved or Pipeline Project Name*	*Daily Trips*	*AM Peak Hour*	*PM Peak Hour*
A	TT 5171 (portion of)[1]	1,086	85	114
B	TT 5341 (portion of)[2]	1,322	104	139
C	TT 5424[2]	1,369	107	144
D	TT 5427[2]	3,238	254	340
E	TT 5464[2]	1,746	137	183
F	TT 5498[1]	755	59	79
G	TT 5531 (portion of)[2]	1,189	93	125
H	TT 5592[2]	2,436	191	255
I	TT 5605[2]	1,284	101	135
J	TT 5626 (portion of)[1]	387	30	41
K	TT 5638[2]	4,295	337	450
L	TT 5717 (portion of)[3]	7,834	489	776
M	TT 5913[3]	1,029	81	108
N	TT 5953[1]	887	70	93
O	TT 5998 (portion of)[1]	736	58	77
P	TT 6067 (portion of)[3]	236	19	25
Q	TT 6095 (portion of)[1]	765	60	80
R	TT 6101[1]	1,048	82	110
S	TT 6107 (portion of)[1]	1,605	126	168
T	TT 6112 (portion of)[1]	519	41	54
U	TT 6114 (portion of)[1]	878	69	92
V	TT 6143 (portion of)[1]	1,520	119	159

Table VI: Near Term Projects' Trip Generation (cont.)

Approved Project Location	*Approved or Pipeline Project Name*	*Daily Trips*	*AM Peak Hour*	*PM Peak Hour*
W	TT 6191[4]	1,038	81	109
X	TT 6214[4]	1,982	155	208
Y	Fancher Creek Town Center (portion of)[1]	62,596	3,251	5,942
Z	Neighborhood Shopping Center (portion of)[3]	2,065	148	159
AA	Sanger Education Center[1]	7,597	2,135	640
AB	Sunnyside Market[1]	1,023	38	54
Total Approved and Pipeline Project Trips		**112,465**	**8,520**	**10,859**

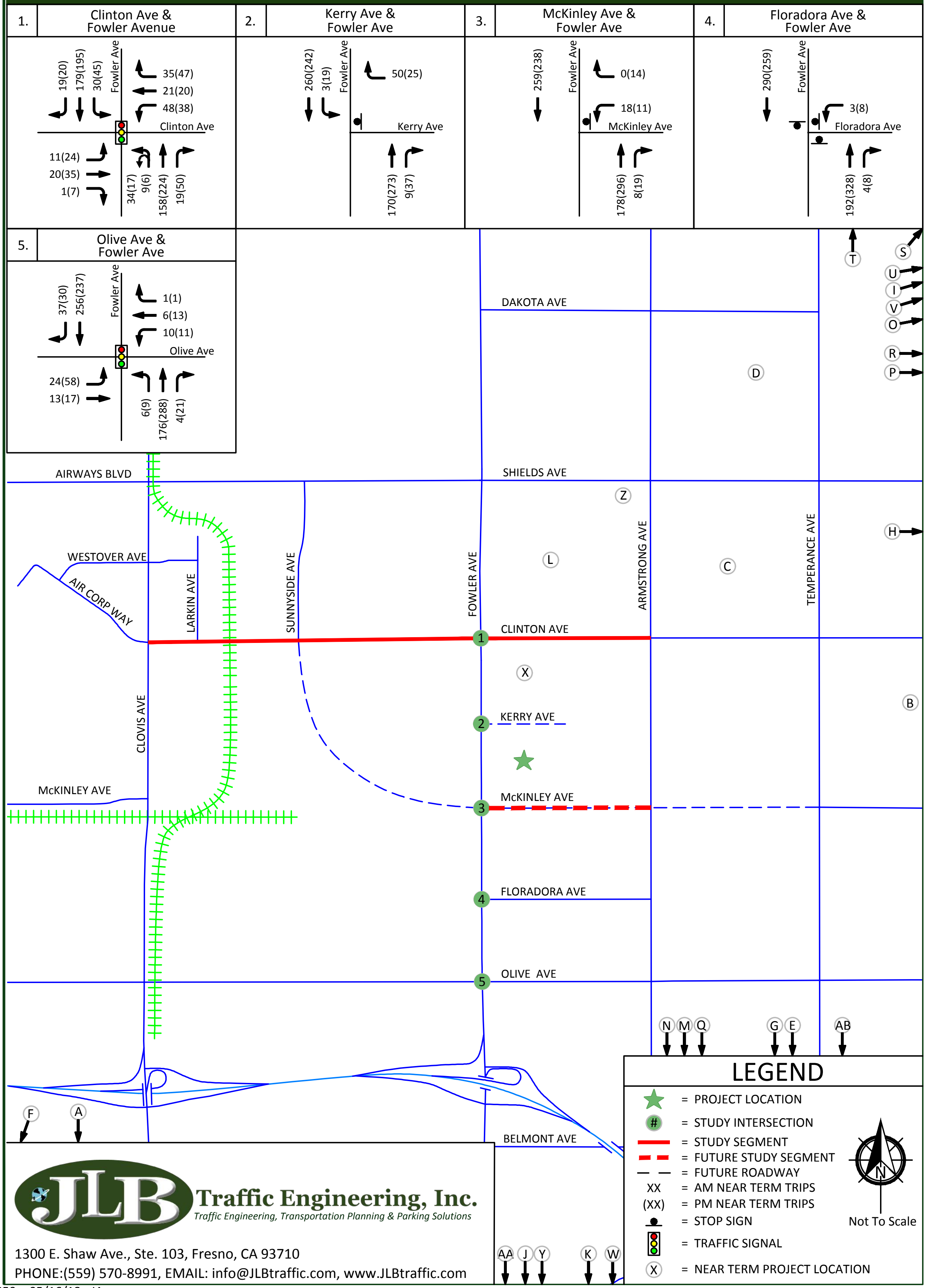
Note: 1 = Trip Generation prepared by JLB Traffic Engineering, Inc. based on readily available information
2 = Trip Generation based on Peters Engineering Traffic Impact Analysis Report
3 = Trip Generation based on TJKM Traffic Impact Analysis Report
4 = Trip Generation based on JLB Traffic Engineering, Inc. Traffic Impact Analysis Report

Traffic Signal Warrants

Peak hour traffic signal warrants, as appropriate, were prepared for the unsignalized intersections in the Near Term plus Project Traffic Conditions scenario. These warrants are found in Appendix J. The effects of right-turning traffic from the minor approach onto the major approach were taken into account using engineering judgement pursuant to the CA MUTCD guidelines for the preparation of traffic signal warrants. Under this scenario, the intersection of McKinley Avenue and Fowler Avenue satisfies the peak hour signal warrant during the AM peak period only. Based on the signal warrant and engineering judgement, signalization of the intersection of McKinley Avenue and Fowler Avenue is not recommended. It is worth noting that CA MUTCD states that "satisfaction of a signal warrant or warrants shall not in itself require the installation of a traffic signal." Therefore, it is recommended that prior to the installation of a traffic signal, investigation of CA MUTCD warrants 1, 4 and 7, as applicable, be conducted for this intersection.

CUSD Fowler-McKinley Elementary School
Near Term Projects' Trip Assignment

Figure 5



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Results of Near Term plus Project Level of Service Analysis

The Near Term plus Project Traffic Conditions scenario assumes the same roadway geometrics and traffic controls as those assumed in the Existing plus Project Traffic Conditions scenario. Figure 6 illustrates the Near Term plus Project turning movement volumes, intersection geometrics and traffic controls. LOS worksheets for the Near Term plus Project Traffic Conditions scenario are provided in Appendix G. Table VII presents a summary of the Near Term plus Project peak hour LOS at the study intersections, while Table VIII presents a summary of the Near Term plus Project LOS for the study segments.

Under this scenario, the intersections of McKinley Avenue and Fowler Avenue and Floradora Avenue and Fowler Avenue are projected to operate at LOS F during one or both peak periods. While the City of Fresno has made the appropriate findings to designate LOS F as the criteria of significance for Fowler Avenue between McKinley Avenue and Olive Avenue, it did so under the assumption that up to four through lanes would be built on Fowler Avenue. To improve the LOS at these intersections, it is recommended that the following improvements be implemented.

- McKinley Avenue and Fowler Avenue
  - Modify the northbound through-right lane to a through lane;
  - Add a second northbound through lane with a receiving lane north of McKinley Avenue;
  - Add a northbound right-turn lane;
  - Add a southbound left-turn lane;
  - Modify the southbound left-through lane to a through lane;
  - Add a second southbound through lane with a receiving lane south of McKinley Avenue; and
  - Implement an all-way stop control.
- Floradora Avenue and Fowler Avenue
  - Add a westbound left-turn lane;
  - Modify the westbound left-right lane to a right-turn lane;
  - Add a northbound through lane with a receiving lane north of Floradora Avenue;
  - Add a southbound left-turn lane;
  - Modify the southbound left-through lane to a through lane;
  - Add a second southbound through lane with a receiving lane south of Floradora Avenue; and
  - Modify the intersection to accommodate the added lanes.

Under this scenario, all study segments are projected to operate at an acceptable LOS.

Between the Existing Traffic Conditions and the Near Term plus Project Traffic Conditions scenarios, the Project accounts for 1.2 percent of the daily trips, 5.6 percent of the AM peak hour trips, and 1.2 percent of the PM peak hour trips of growth in traffic, while the rest can be attributable to the Near Term Projects. Therefore, one can deduce that the majority of the mitigation measures presented under this scenario may not be necessary immediately upon completion of the proposed Project. However, if all of the Near Term Projects are completed close to the completion date of the proposed Project, the detailed recommended improvements presented under this scenario may be necessary in order to improve the LOS to the City's target LOS threshold.

Table VII: Near Term plus Project Intersection LOS Results

ID	Intersection	Intersection Control	(7-9) AM Peak Hour		(4-6) PM Peak Hour	
			Average Delay (sec/veh)	LOS	Average Delay (sec/veh)	LOS
1	Clinton Avenue / Fowler Avenue	Signalized	44.5	D	41.8	D
2	Kerry Avenue / Fowler Avenue	One-Way Stop	20.0	C	17.7	C
3	McKinley Avenue / Fowler Avenue	One-Way Stop	**>120.0**	**F**	**45.4**	**E**
		All-Way Stop (Improved)	22.4	C	24.0	C
4	Floradora Avenue / Fowler Avenue	All-Way Stop	**66.6**	**F**	**96.4**	**F**
		All-Way Stop (Improved)	18.2	C	31.6	D
5	Olive Avenue / Fowler Avenue	Signalized	37.9	D	26.2	C

Note: LOS = Level of Service based on average delay on signalized intersections and All-Way STOP Controls
LOS for two-way and one-way STOP controlled intersections are based on the worst approach/movement of the minor street.

Table VIII: Near Term plus Project Segment LOS Results

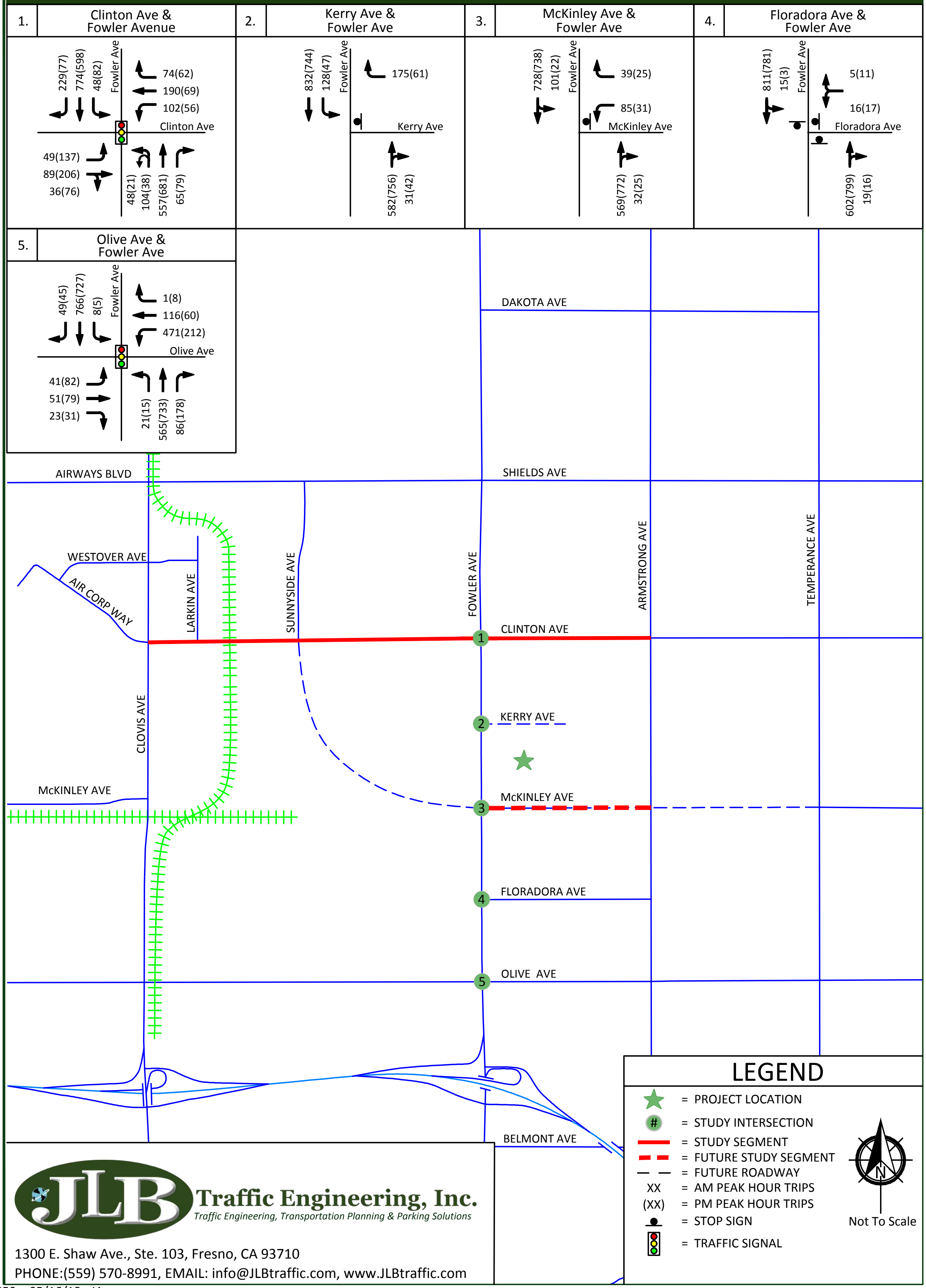
ID	Segment	Limits	Lanes	24-hour Volume	LOS
1	Clinton Avenue	Clovis Avenue and Fowler Avenue	2	6,844	C
2	Clinton Avenue	Fowler Avenue and Armstrong Avenue	2	5,051	B
3	McKinley Avenue	Fowler Avenue and Armstrong Avenue	2	2,750	B

Note: LOS = Level of Service per the Florida Roadway Segment LOS Tables

CUSD Fowler-McKinley Elementary School

Figure 6

Near Term plus Project - Traffic Volumes, Geometrics and Controls



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Cumulative Year 2035 No Project Traffic Conditions

The Cumulative Year 2035 No Project Traffic Conditions scenario assumes that the existing roadway geometrics and traffic controls will remain in place with one two exceptions. For purposes of this TIA, it was assumed that McKinley Avenue extends to and through Fowler Avenue by the year 2035. It was assumed that McKinley Avenue would be built as two-lane collector divided by a two-way left-turn lane. Furthermore, it was assumed that this intersection would be controlled by a two-way stop on McKinley and contain a left-turn lane with a through-right lane on all approaches. Based on communication with City of Fresno and County of Fresno staff, CMAQ funding to signalize the intersection of Olive Avenue and Fowler Avenue has recently been received. It is anticipated that this work will be completed by the year 2023. Signalization of the intersection of Olive Avenue and Fowler Avenue will include protective left-turn phasing in all directions and a left-turn lane, a through lane, and a right-turn lane on all approaches. Therefore, this scenario assumes that the intersection of Olive Avenue and Fowler Avenue is signalized with protective left-turn phasing in all directions.

Traffic Signal Warrants

Peak hour traffic signal warrants, as appropriate, were prepared for the unsignalized intersections in the Cumulative Year 2035 No Project Traffic Conditions scenario. These warrants are found in Appendix J. The effects of right-turning traffic from the minor approach onto the major approach were taken into account using engineering judgement pursuant to the CA MUTCD guidelines for the preparation of traffic signal warrants. Under this scenario, the intersection of McKinley Avenue and Fowler Avenue satisfies the peak hour signal warrant during both peak periods. Based on the signal warrants and engineering judgement, signalization of the intersection of McKinley Avenue and Fowler Avenue is recommended.

Results of Cumulative Year 2035 No Project Level of Service Analysis

The Cumulative Year 2035 No Project Traffic Conditions scenario assumes that McKinley Avenue will exist west and east of Fowler Avenue. Figure 7 illustrates the Cumulative Year 2035 No Project turning movement volumes, intersection geometrics and traffic controls. LOS worksheets for the Cumulative Year 2035 No Project Traffic Conditions scenario are provided in Appendix H. Table IX presents a summary of the Cumulative Year 2035 No Project peak hour LOS at the study intersections, while Table X presents a summary of the Cumulative year 2035 No Project LOS for the study segments.

Under this scenario, the intersections of McKinley Avenue and Fowler Avenue, Floradora Avenue and Fowler Avenue, and Olive Avenue and Fowler Avenue are projected to operate at LOS F during both peak periods. While the City of Fresno has made the appropriate findings to designate LOS F as the criteria of significance for Fowler Avenue between McKinley Avenue and Olive Avenue, it did so under the assumption that up to four through lanes would be built on Fowler Avenue. Therefore, to improve the LOS at these intersections, it is recommended that the following improvements be implemented.

- McKinley Avenue and Fowler Avenue
  - Modify the eastbound through-right lane to a through lane;
  - Add an eastbound right-turn lane;
  - Modify the westbound through-right lane to a through lane;

- Add a westbound right-turn lane;
- Modify the northbound through-right lane to a through lane;
- Add a second northbound through lane with a receiving lane north of McKinley Avenue;
- Add a northbound right-turn lane;
- Modify the southbound through-right lane to a through lane;
- Add a second southbound through lane with a receiving lane south of McKinley Avenue;
- Add a southbound right-turn lane;
- Signalize the intersection with protective left-turn phasing in all directions;
- Implement overlap phasing of the eastbound right-turn with the northbound left-turn phase; and
- Prohibit northbound to southbound U-turns.

- Floradora Avenue and Fowler Avenue
  - Add a northbound through lane with a receiving lane north of Floradora Avenue;
  - Add a southbound through lane with a receiving lane south of Floradora Avenue;
  - Install a two-lane roundabout (for northbound and southbound traffic); and
  - Modify the intersection to accommodate the added lanes.
- Olive Avenue and Fowler Avenue
  - Add a second westbound left-turn lane;
  - Add a second northbound through lane with a receiving lane north of Olive Avenue;
  - Add a second southbound through lane with a receiving lane south of Olive Avenue; and
  - Modify the traffic signal to accommodate the added lanes.

Under this scenario, all study segments are projected to operate at an acceptable LOS.

Table IX: Cumulative Year 2035 No Project Intersection LOS Results

ID	Intersection	Intersection Control	(7-9) AM Peak Hour		(4-6) PM Peak Hour	
			Average Delay (sec/veh)	LOS	Average Delay (sec/veh)	LOS
1	Clinton Avenue / Fowler Avenue	Signalized	41.3	D	44.7	D
2	Kerry Avenue / Fowler Avenue	One-Way Stop	N/A	N/A	N/A	N/A
3	McKinley Avenue / Fowler Avenue	Two-Way Stop	**>120.0**	**F**	**>120.0**	**F**
		Signalized (Improved)	40.5	D	36.4	D
4	Floradora Avenue / Fowler Avenue	All-Way Stop	**>120.0**	**F**	**>120.0**	**F**
		Roundabout (Improved)	10.4	B	12.0	B
5	Olive Avenue / Fowler Avenue	Signalized	**>120.0**	**F**	**>120.0**	**F**
		Signalized (Improved)	39.9	D	38.3	D

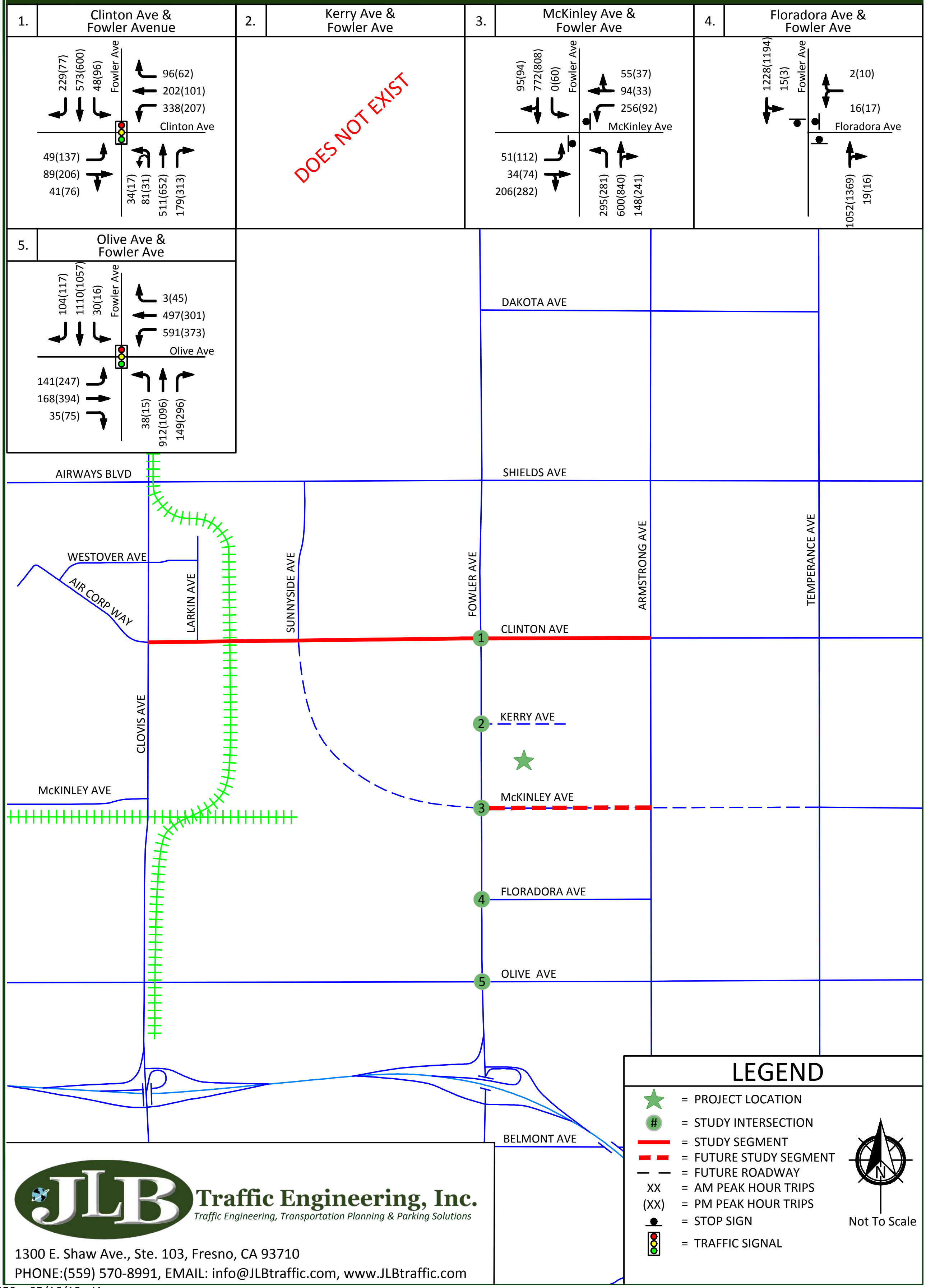
Note: LOS = Level of Service based on average delay on signalized intersections and All-Way STOP Controls.
LOS for two-way STOP controlled intersections are based on the worst approach/movement of the minor street.

Table X: Cumulative Year 2035 No Project Segment LOS Results

ID	Segment	Limits	Lanes	24-hour Volume	LOS
1	Clinton Avenue	Clovis Avenue and Fowler Avenue	2	6,910	C
2	Clinton Avenue	Fowler Avenue and Armstrong Avenue	2	9,850	C
3	McKinley Avenue	Fowler Avenue and Armstrong Avenue	2	5,870	C

Note: LOS = Level of Service per the Florida Roadway Segment LOS Tables

CUSD Fowler-McKinley Elementary School
Figure 7
Cumulative Year 2035 No Project - Traffic Volumes, Geometrics and Controls



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Cumulative Year 2035 plus Project Traffic Conditions

The Cumulative Year 2035 plus Project Traffic Conditions scenario assumes the same roadway geometrics and traffic controls as those assumed in the Existing plus Project Traffic Conditions scenario with one exception. Similar to the Cumulative Year 2035 No Project Traffic Conditions scenario, the Cumulative Year 2035 plus Project Traffic Conditions scenario assumes that McKinley Avenue will exist west and east of Fowler Avenue. Considering the potential changes in the existing roadway network, it is projected that travel patterns and volumes may differ from what is anticipated for the immediate Project buildout. Figure 8 illustrates the 2035 Project Only Trips to the study intersections.

Traffic Signal Warrants

Peak hour traffic signal warrants, as appropriate, were prepared for the unsignalized intersections in the Cumulative Year 2035 plus Project Traffic Conditions scenario. These warrants are found in Appendix J. The effects of right-turning traffic from the minor approach onto the major approach were taken into account using engineering judgement pursuant to the CA MUTCD guidelines for the preparation of traffic signal warrants. Under this scenario, the intersections of McKinley Avenue and Fowler Avenue satisfies the peak hour signal warrant during both peak periods. Based on the signal warrant and engineering judgement, signalization of the intersection of McKinley Avenue and Fowler Avenue is recommended.

Results of Cumulative Year 2035 plus Project Level of Service Analysis

The Cumulative Year 2035 plus Project Traffic Conditions scenario assumes that McKinley Avenue will exist west and east of Fowler Avenue. Figure 9 illustrates the Cumulative Year 2035 plus Project turning movement volumes, intersection geometrics and traffic controls. LOS worksheets for the Cumulative Year 2035 plus Project Traffic Conditions scenario are provided in Appendix I. Table XI presents a summary of the Cumulative Year 2035 plus Project peak hour LOS at the study intersections, while Table XII presents a summary of the Cumulative year 2035 plus Project LOS for the study segments.

Under this scenario, the intersection of Clinton Avenue and Fowler Avenue is projected to exceed its LOS threshold during the AM peak period. To improve the LOS at this intersection, it is recommended that the following improvements be implemented.

- Clinton Avenue and Fowler Avenue
  - Add a second northbound through lane;
  - Modify the southbound right-turn lane to a through-right lane and add a receiving lane south of Clinton Avenue; and
  - Modify the traffic signal to accommodate the added lanes.

In addition, the intersections of McKinley Avenue and Fowler Avenue, Floradora Avenue and Fowler Avenue, and Olive Avenue and Fowler Avenue are projected to operate at LOS F during both peak periods. While the City of Fresno has made the appropriate findings to designate LOS F as the criteria of significance for Fowler Avenue between McKinley Avenue and Olive Avenue, it did so under the assumption that up to four through lanes would be built on Fowler Avenue. Therefore, to improve the LOS at these intersections, it is recommended that the following improvements be implemented.

- McKinley Avenue and Fowler Avenue
  - Modify the eastbound through-right lane to a through lane;
  - Add an eastbound right-turn lane;
  - Modify the westbound through-right lane to a through lane;
  - Add a westbound right-turn lane;
  - Modify the northbound through-right lane to a through lane;
  - Add a second northbound through lane with a receiving lane north of McKinley Avenue;
  - Add a northbound right-turn lane;
  - Modify the southbound through-right lane to a through lane;
  - Add a second southbound through lane with a receiving lane south of McKinley Avenue;
  - Add a southbound right-turn lane;
  - Signalize the intersection with protective left-turn phasing in all directions;
  - Implement overlap phasing of the eastbound right-turn with the northbound left-turn phase; and
  - Prohibit northbound to southbound U-turns.
- Floradora Avenue and Fowler Avenue
  - Add a northbound through lane with a receiving lane north of Floradora Avenue;
  - Add a southbound through lane with a receiving lane south of Floradora Avenue;
  - Install a two-lane roundabout (for northbound and southbound traffic); and
  - Modify the intersection to accommodate the added lanes.
- Olive Avenue and Fowler Avenue
  - Add a second westbound left-turn lane;
  - Add a second northbound through lane with a receiving lane north of Olive Avenue;
  - Add a second southbound through lane with a receiving lane south of Olive Avenue; and
  - Modify the traffic signal to accommodate the added lanes.

Moreover, while the intersection of Kerry Avenue and Fowler Avenue is projected to operate at an acceptable LOS during both peak periods, it was modified due to its proximity to both Clinton Avenue and McKinley Avenue. Therefore, it is recommended that the following improvements be implemented.

- Kerry Avenue and Fowler Avenue
  - Add a northbound through lane with a receiving lane north of Kerry Avenue;
  - Add a southbound through lane with a receiving lane south of Kerry Avenue; and
  - Modify the intersection to accommodate the added lanes.

Under this scenario, all study segments are projected to operate at an acceptable LOS.

Table XI: Cumulative Year 2035 plus Project Intersection LOS Results

ID	Intersection	Intersection Control	(7-9) AM Peak Hour		(4-6) PM Peak Hour	
			Average Delay (sec/veh)	LOS	Average Delay (sec/veh)	LOS
1	Clinton Avenue / Fowler Avenue	Signalized	**72.6**	**E**	54.6	D
		Signalized (Mitigated)	48.5	D	33.1	C
2	Kerry Avenue / Fowler Avenue	One-Way Stop	26.0	D	23.3	C
		One-Way Stop (Improved)	14.5	B	13.8	B
3	McKinley Avenue / Fowler Avenue	Two-Way Stop	**>120.0**	**F**	**>120.0**	**F**
		Signalized (Improved)	49.6	D	37.3	D
4	Floradora Avenue / Fowler Avenue	All-Way Stop	**>120.0**	**F**	**>120.0**	**F**
		Roundabout (Improved)	11.2	B	12.3	B
5	Olive Avenue / Fowler Avenue	Signalized	**>120.0**	**F**	**>120.0**	**F**
		Signalized (Improved)	45.0	D	39.1	D

Note: LOS = Level of Service based on average delay on signalized intersections and All-Way STOP Controls.
LOS for two-way STOP controlled intersections are based on the worst approach/movement of the minor street.

Table XII: Cumulative Year 2035 plus Project Segment LOS Results

ID	Segment	Limits	Lanes	24-hour Volume	LOS
1	Clinton Avenue	Clovis Avenue and Fowler Avenue	2	7,110	C
2	Clinton Avenue	Fowler Avenue and Armstrong Avenue	2	10,250	C
3	McKinley Avenue	Fowler Avenue and Armstrong Avenue	2	8,130	C

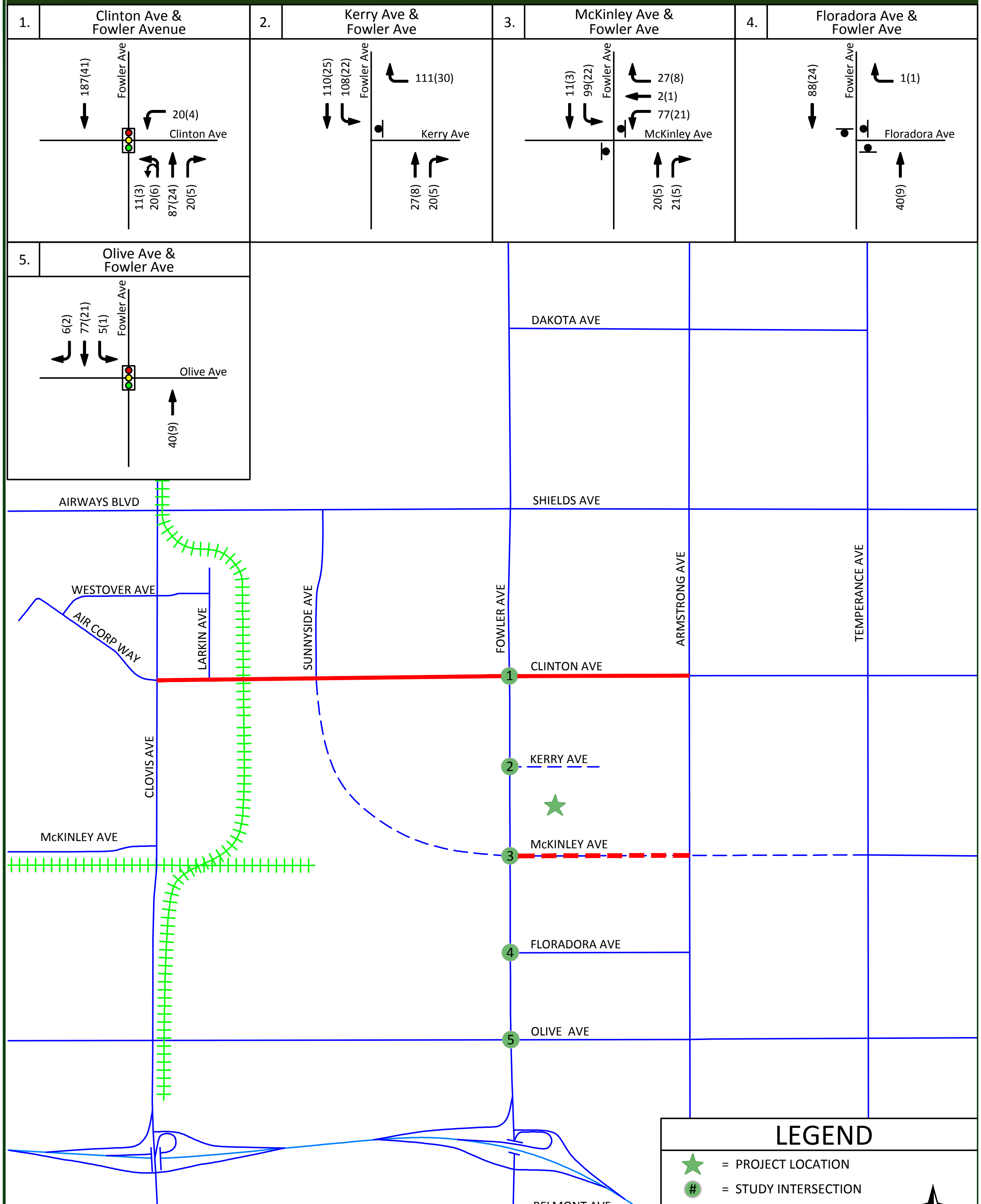
Note: LOS = Level of Service per the Florida Roadway Segment LOS Tables

Project's Trip Assignment to Caltrans Facilities

The 2035 Project Only Trip assignment to the interchange of State Route 180 at Fowler Avenue is illustrated in Figure 10.

CUSD Fowler-McKinley Elementary School
2035 Project Only Trips

Figure 8



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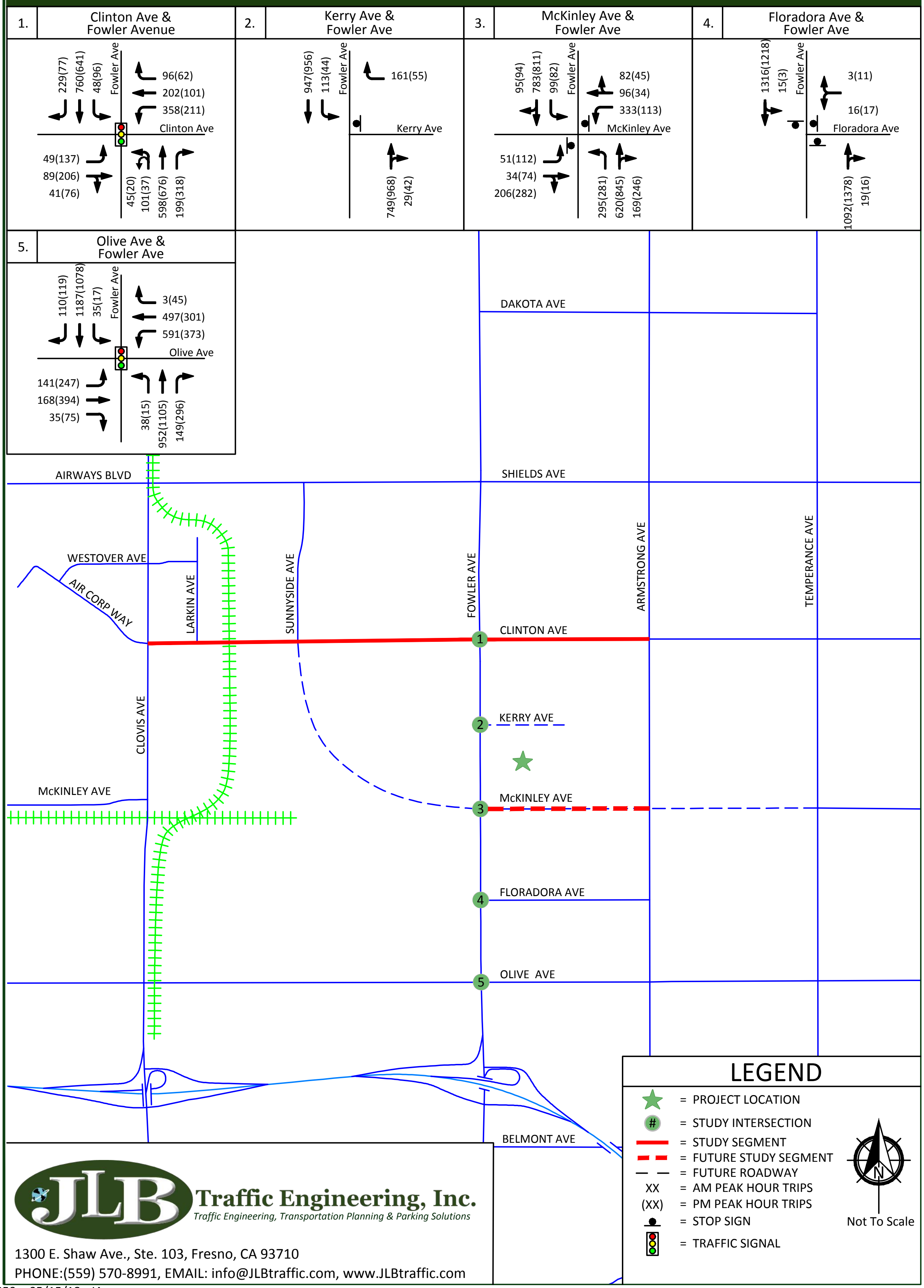
CUSD Fowler-McKinley Elementary School — Figure 9
Cumulative Year 2035 plus Project - Traffic Volumes, Geometrics and Controls



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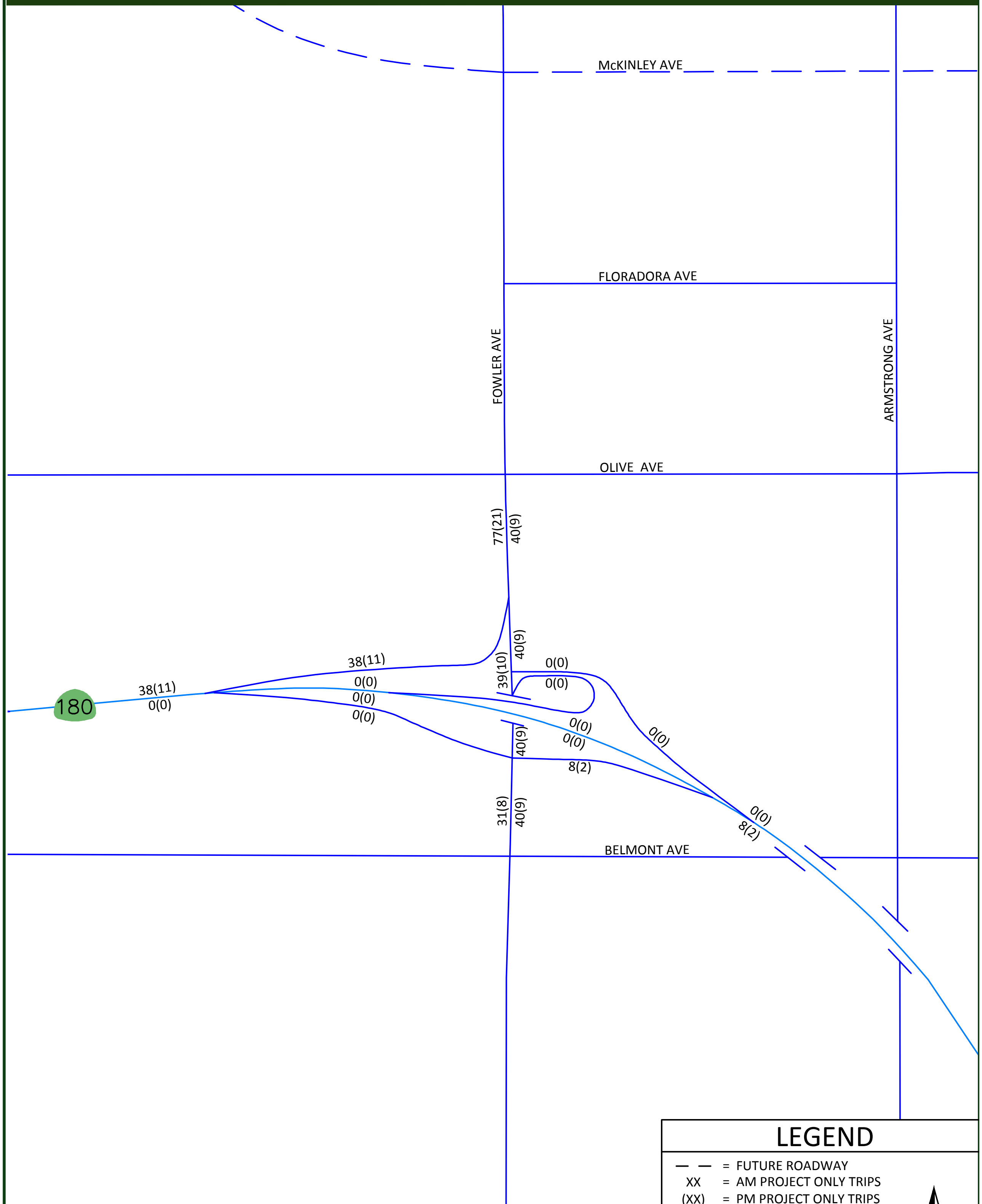
CUSD Fowler-McKinley Elementary School

Figure 10

State Route 180 at Fowler Avenue Interchange - 2035 Project Only Trips



LEGEND

— — = FUTURE ROADWAY
XX = AM PROJECT ONLY TRIPS
(XX) = PM PROJECT ONLY TRIPS

N

Not To Scale

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Queuing Analysis

Table XIII provides a queue length summary for left-turn and right-turn lanes at the study intersections under all study scenarios. The queuing analyses for the study intersections are contained in the LOS worksheets for the respective scenarios. Appendix D contains the methodologies used to evaluate these intersections. Queuing analyses were completed using Sim Traffic output information. Synchro provides both 50th and 95th percentile maximum queue lengths (in feet). According to the Synchro manual, "the 50th percentile maximum queue is the maximum back of queue on a typical cycle and the 95th percentile queue is the maximum back of queue with 95th percentile volumes." The queues shown on Table XIII are the 95th percentile queue lengths for the respective lane movements.

The Highway Design Manual (HDM) provides guidance for determining deceleration lengths for the left-turn and right-turn lanes based on design speeds. Per the HDM criteria, "tapers for right-turn lanes are usually un-necessary since the main line traffic need not be shifted laterally to provide space for the right-turn lane. If, in some rare instances, a lateral shift were needed, the approach taper would use the same formula as for a left-turn lane." Therefore, a bay taper length pursuant to the Caltrans HDM would need to be added, as necessary, to the recommended storage lengths presented in Table XIII.

Based on the SimTraffic output files and engineering judgement, it is recommended that the storage capacity for the following be considered for the Cumulative Year 2035 plus Project Traffic Conditions. While the City of Fresno does not have minimum storage length requirements for left-turn and right-turn lanes on major streets, it does prefer that these be set at 200 feet for left-turns and 75 feet for right-turns. At the remaining approaches of the study intersections, the greater of the existing storage capacity or the 200 feet left-turn lanes and 75 feet right-turn lanes will be sufficient to accommodate the maximum queue.

- Clinton Avenue and Fowler Avenue
  - Consider increasing the storage capacity of the eastbound left-turn lane to 200 feet.
  - Consider increasing the storage capacity of the westbound left-turn lane to 325 feet.
  - Consider increasing the storage capacity of the northbound left-turn lane to 275 feet.
  - Consider increasing the storage capacity of the northbound right-turn lane to 150 feet.
- McKinley Avenue and Fowler Avenue
  - Consider setting the storage capacity of the eastbound right-turn lane to 175 feet.
  - Consider setting the storage capacity of the westbound left-turn lane to 350 feet.
  - Consider setting the storage capacity of the northbound left-turn lane to 325 feet.
  - Consider setting the storage capacity of the northbound right-turn lane 100 feet.
  - Consider setting the storage capacity of the southbound left-turn lane to 250 feet.
  - Consider setting the storage capacity of the southbound right-turn lane to 150 feet.
- Olive Avenue and Fowler Avenue
  - Consider increasing the storage capacity of the eastbound left-turn lane to 300 feet.
  - Consider setting the storage capacity of the eastbound right-turn lane to 250 feet.
  - Consider setting the storage capacity of the dual westbound left-turn lanes to 300 feet.
  - Consider setting the storage capacity of the northbound right-turn lane to 150 feet.
  - Consider setting the storage capacity of the southbound right-turn lane to 325 feet.

Table XIII: Queuing Analysis

ID	Intersection	Existing Queue Storage Length (ft.)		Existing		Existing plus Project		Near Term plus Project		Cumulative Year 2035 No Project		Cumulative Year 2035 plus Project	
				AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1	Clinton Avenue / Fowler Avenue	EB Left	150	73	100	55	102	89	153	85	162	93	180
		WB Left	225	67	32	96	47	148	89	319	266	326	253
		WB Right	105	43	33	56	32	148	43	128	60	109	38
		NB Left	175	87	44	118	58	265	204	270	238	197	87
		NB Right	40	55	75	70	49	93	120	125	140	83	142
		SB Left	255	37	42	39	53	162	210	163	148	184	145
		SB Right	>500	83	27	74	30	55	40	96	49	*	*
2	Kerry Avenue / Fowler Avenue	WB Right	*	*	*	70	44	98	55	*	*	93	56
		SB Left	*	*	*	57	42	77	63	*	*	73	41
3	McKinley Avenue / Fowler Avenue	EB Left	*	*	*	*	*	*	*	89	118	104	145
		EB Right	*	*	*	*	*	*	*	142	147	165	135
		WB Left	*	*	*	58	45	43	29	276	116	345	163
		WB Right	*	*	*	49	25	27	27	44	29	58	45
		NB Left	*	*	*	*	*	*	*	296	273	331	265
		NB Right	*	*	*	*	*	52	46	70	79	65	70
		SB Left	*	*	*	*	*	69	43	*	104	229	117
		SB Right	*	*	*	*	*	*	*	50	57	148	57
4	Floradora Avenue / Fowler Avenue	WB Left	*	*	*	*	*	28	38	*	*	*	*
		WB Right	>500	*	*	*	*	21	25	*	*	*	*
		SB Left	*	*	*	*	*	37	20	*	*	*	*
		WB Approach	*	*	*	*	*	*	*	19	33	33	41
		NB Approach	*	*	*	*	*	*	*	91	73	79	58
		SB Approach	*	*	*	*	*	*	*	59	59	72	59
5	Olive Avenue / Fowler Avenue	EB Left	185	42	52	40	38	59	82	170	289	136	305
		EB Right	*	*	*	38	43	29	28	41	75	34	235
		WB Left	200	276	175	304	145	300	250	*	*	*	*
		WB Dual Lefts	*	*	*	*	*	*	*	303	162	304	200
		WB Right	*	*	*	0	10	0	22	8	35	17	34
		NB Left	*	48	29	30	12	45	35	54	46	66	25
		NB Right	*	*	*	35	53	133	143	62	134	59	131
		SB Left	*	13	9	33	0	33	24	78	26	152	29
		SB Right	*	*	*	15	15	259	26	144	57	321	57

Note: * = Does not exist or is not projected to exist

Project's Pro-Rata Fair Share of Future Transportation Improvements

The Project's fair share percentage impact to study intersections projected to fall below their LOS threshold and which are not covered by an existing impact fee program is provided in Table XIV. The Project's fair share percentage impacts were calculated pursuant to the Caltrans Guide for the Preparation of Traffic Impact Studies. The Project's pro-rata fair shares were calculated utilizing the Existing volumes, 2035 Project Only Trips and Cumulative Year 2035 plus Project volumes. Figure 2 illustrates the Existing traffic volumes, Figure 8 illustrates the 2035 Project Only Trips, and Figure 9 illustrates the Cumulative Year 2035 plus Project traffic volumes. Since the critical peak period for the study facilities was determined to be during the AM peak, the AM peak volumes are utilized to determine the Project's pro-rata fair share.

It is recommended that the Project contribute its equitable fair share as listed in Table XIV for the future improvements necessary to maintain an acceptable LOS. However, fair share contributions should only be made for those facilities or portion thereof currently not funded by the responsible agencies roadway impact fee program(s), as appropriate. For those improvements not presently covered by local and regional roadway impact fee programs, it is recommended that the Project contribute its equitable fair share. Payment of the Project's equitable fair share in addition to the local and regional impact fee programs would satisfy the Project's traffic mitigation measures.

This study does not provide construction costs for the recommended mitigation measures; therefore, if the recommended mitigation measures are implemented, it is recommended that the developer work with the City of Fresno to develop the estimated construction cost.

Table XIV: Project's Fair Share of Future Roadway Improvements

ID	*Intersection*	*Existing Traffic Volumes (AM Peak)*	*Cumulative Year 2035 plus Project Traffic Volumes (AM Peak)*	*2035 Project Only Trips (AM Peak)*	*Project's Fair Share (%)*
4	Floradora Avenue / Fowler Avenue	852	2,461	129	8.02%

Note: Project Fair Share = ((2035 Project Only Trips) / (Cumulative Year 2035 + Project Traffic Volumes - Existing Traffic Volumes)) x 100

Conclusions and Recommendations

Conclusions and recommendations regarding the proposed Project are presented below.

Existing Traffic Conditions

- At present, all study intersections operate at an acceptable LOS. However, the intersection of Olive Avenue and Fowler Avenue is operating at LOS F during both peak periods. While the City of Fresno has made the appropriate findings to designate LOS F as the criteria of significance for Fowler Avenue between McKinley Avenue and Olive Avenue, it did so under the assumption that up to four through lanes would be built on Fowler Avenue. To improve the LOS at this intersection, it is recommended that the following improvements, which are included within the City of Fresno Traffic Signal Mitigation Impact (TSMI) fee, be implemented.
  - Olive Avenue and Fowler Avenue
    - Add a northbound left-turn lane;
    - Modify the northbound left-through-right lane to a through-right lane;
    - Add a southbound left-turn lane;
    - Modify the southbound left-through-right lane to a through-right lane;
    - Signalize the intersection with protective left-turn phasing in all directions; and
    - Modify the intersection to accommodate the added lanes.
- At present, all study segments operate at an acceptable LOS.

Existing plus Project Traffic Conditions

- It is recommended that the CUSD coordinate with the City of Fresno on the ultimate placement of the future Project driveways to ensure that the location of the proposed access points relative to the existing local roads and driveways in the Project's vicinity are located at points that minimize traffic operational impacts to the roadway network.
- It is recommended that the Project incorporate the recommendations presented in more detail within the Queuing Analysis for the intersection of McKinley Avenue and Fowler Avenue.
- It is recommended that the Project implement a Class II Bike Lane along its frontage to Fowler Avenue.
- It is recommended that the Project conduct a warrant analysis for a hybrid beacon across Clinton Avenue at the future Laverne Avenue intersection prior to construction of the Project.
- At build-out, the proposed Project is estimated to generate a maximum of 1,418 daily trips, 503 AM peak hour trips and 128 PM peak hour trips.
- It is recommended that the CUSD work with the City of Fresno to implement a Safe Routes to School plan and seek grant funding to help build walkways where they are lacking within a two-mile radius of the Project site.
- Under this scenario, all study intersections and segments are projected to operate at an acceptable LOS.

Near Term plus Project Traffic Conditions

- The total trip generation for the Near Term Projects is 112,465 daily trips, 8,520 AM peak hour trips and 10,859 PM peak hour trips.

- Under this scenario, the intersections of McKinley Avenue and Fowler Avenue and Floradora Avenue and Fowler Avenue are projected to operate at LOS F during one or both peak periods. While the City of Fresno has made the appropriate findings to designate LOS F as the criteria of significance for Fowler Avenue between McKinley Avenue and Olive Avenue, it did so under the assumption that up to four through lanes would be built on Fowler Avenue. To improve the LOS at these intersections, it is recommended that the following improvements be implemented.
  - McKinley Avenue and Fowler Avenue
    - Modify the northbound through-right lane to a through lane;
    - Add a second northbound through lane with a receiving lane north of McKinley Avenue;
    - Add a northbound right-turn lane;
    - Add a southbound left-turn lane;
    - Modify the southbound left-through lane to a through lane;
    - Add a second southbound through lane with a receiving lane south of McKinley Avenue; and
    - Implement an all-way stop control.
  - Floradora Avenue and Fowler Avenue
    - Add a westbound left-turn lane;
    - Modify the westbound left-right lane to a right-turn lane;
    - Add a northbound through lane with a receiving lane north of Floradora Avenue;
    - Add a southbound left-turn lane;
    - Modify the southbound left-through lane to a through lane;
    - Add a second southbound through lane with a receiving lane south of Floradora Avenue; and
    - Modify the intersection to accommodate the added lanes.
- Under this scenario, all study segments are projected to operate at an acceptable LOS.
- Between the Existing Traffic Conditions and the Near Term plus Project Traffic Conditions scenarios, the Project accounts for 1.2 percent of the daily trips, 5.6 percent of the AM peak hour trips, and 1.2 percent of the PM peak hour trips of growth in traffic, while the rest can be attributable to the Near Term Projects. Therefore, one can deduce that the majority of the mitigation measures presented under this scenario may not be necessary immediately upon completion of the proposed Project.

Cumulative Year 2035 No Project Traffic Conditions

- Under this scenario, the intersections of McKinley Avenue and Fowler Avenue, Floradora Avenue and Fowler Avenue, and Olive Avenue and Fowler Avenue are projected to operate at LOS F during both peak periods. While the City of Fresno has made the appropriate findings to designate LOS F as the criteria of significance for Fowler Avenue between McKinley Avenue and Olive Avenue, it did so under the assumption that up to four through lanes would be built on Fowler Avenue. Therefore, to improve the LOS at these intersections, it is recommended that the following improvements be implemented.
  - McKinley Avenue and Fowler Avenue
    - Modify the eastbound through-right lane to a through lane;
    - Add an eastbound right-turn lane;
    - Modify the westbound through-right lane to a through lane;
    - Add a westbound right-turn lane;
    - Modify the northbound through-right lane to a through lane;

    - Add a second northbound through lane with a receiving lane north of McKinley Avenue;
    - Add a northbound right-turn lane;
    - Modify the southbound through-right lane to a through lane;
    - Add a second southbound through lane with a receiving lane south of McKinley Avenue;
    - Add a southbound right-turn lane;
    - Signalize the intersection with protective left-turn phasing in all directions;
    - Implement overlap phasing of the eastbound right-turn with the northbound left-turn phase; and
    - Prohibit northbound to southbound U-turns.
  - Floradora Avenue and Fowler Avenue
    - Add a northbound through lane with a receiving lane north of Floradora Avenue;
    - Add a southbound through lane with a receiving lane south of Floradora Avenue;
    - Install a two-lane roundabout (for northbound and southbound traffic); and
    - Modify the intersection to accommodate the added lanes.
  - Olive Avenue and Fowler Avenue
    - Add a second westbound left-turn lane;
    - Add a second northbound through lane with a receiving lane north of Olive Avenue;
    - Add a second southbound through lane with a receiving lane south of Olive Avenue; and
    - Modify the traffic signal to accommodate the added lanes.
- Under this scenario, all study segments are projected to operate at an acceptable LOS.

Cumulative Year 2035 plus Project Traffic Conditions

- Under this scenario, the intersection of Clinton Avenue and Fowler Avenue is projected to exceed its LOS threshold during the AM peak period. To improve the LOS at this intersection, it is recommended that the following improvements be implemented.
  - Clinton Avenue and Fowler Avenue
    - Add a second northbound through lane;
    - Modify the southbound right-turn lane to a through-right lane and add a receiving lane south of Clinton Avenue; and
    - Modify the traffic signal to accommodate the added lanes.
- In addition, the intersections of McKinley Avenue and Fowler Avenue, Floradora Avenue and Fowler Avenue, and Olive Avenue and Fowler Avenue are projected to operate at LOS F during both peak periods. While the City of Fresno has made the appropriate findings to designate LOS F as the criteria of significance for Fowler Avenue between McKinley Avenue and Olive Avenue, it did so under the assumption that up to four through lanes would be built on Fowler Avenue. Therefore, to improve the LOS at these intersections, it is recommended that the following improvements be implemented.
  - McKinley Avenue and Fowler Avenue
    - Modify the eastbound through-right lane to a through lane;
    - Add an eastbound right-turn lane;
    - Modify the westbound through-right lane to a through lane;
    - Add a westbound right-turn lane;
    - Modify the northbound through-right lane to a through lane;

        - Add a second northbound through lane with a receiving lane north of McKinley Avenue;
        - Add a northbound right-turn lane;
        - Modify the southbound through-right lane to a through lane;
        - Add a second southbound through lane with a receiving lane south of McKinley Avenue;
        - Add a southbound right-turn lane;
        - Signalize the intersection with protective left-turn phasing in all directions;
        - Implement overlap phasing of the eastbound right-turn with the northbound left-turn phase; and
        - Prohibit northbound to southbound U-turns.
    - Floradora Avenue and Fowler Avenue
        - Add a northbound through lane with a receiving lane north of Floradora Avenue;
        - Add a southbound through lane with a receiving lane south of Floradora Avenue;
        - Install a two-lane roundabout (for northbound and southbound traffic); and
        - Modify the intersection to accommodate the added lanes.
    - Olive Avenue and Fowler Avenue
        - Add a second westbound left-turn lane;
        - Add a second northbound through lane with a receiving lane north of Olive Avenue;
        - Add a second southbound through lane with a receiving lane south of Olive Avenue; and
        - Modify the traffic signal to accommodate the added lanes.
- Moreover, while the intersection of Kerry Avenue and Fowler Avenue is projected to operate at an acceptable LOS during both peak periods, it was modified due to its proximity to both Clinton Avenue and McKinley Avenue. Therefore, it is recommended that the following improvements be implemented.
    - Kerry Avenue and Fowler Avenue
        - Add a northbound through lane with a receiving lane north of Kerry Avenue;
        - Add a southbound through lane with a receiving lane south of Kerry Avenue; and
        - Modify the intersection to accommodate the added lanes.
- Under this scenario, all study segments are projected to operate at an acceptable LOS.

Queuing Analysis

- It is recommended that the City consider left-turn and right-turn lane storage lengths as indicated in Table XIII.

Project's Equitable Fair Share

- It is recommended that the Project contribute its equitable Fair Share as presented in Table XIV.

Study Participants

JLB Traffic Engineering, Inc. Personnel:

Jose Luis Benavides, PE, TE	Project Manager
Susana Maciel, EIT	Engineer I/II
Javier Rios	Engineer I/II
Jove Alcazar	Engineer I/II

Persons Consulted:

Scott B. Odell, AICP	Odell Planning & Research, Inc.
Jill Gormley, PE	City of Fresno
Harpreet Kooner	County of Fresno
Tong Xiong	County of Fresno
David Padilla	Caltrans
Kai Han, TE	Fresno COG
Lang Yu	Fresno COG

References

1. City of Fresno, *2035 General Plan*.
2. County of Fresno, *2000 General Plan*.
3. *Guide for the Preparation of Traffic Impact Studies*, Caltrans, dated December 2002.
4. *Trip Generation,* 10th Edition, Washington D.C., Institute of Transportation Engineers, 2017.
5. *2014 California Manual on Uniform Traffic Control Devices*, Caltrans, November 7, 2014.

Appendix A: Scope of Work

March 14, 2018

Mrs. Jill Gormley, P.E.
City of Fresno
2600 Fresno Street
Fresno, CA 93721

Via E-mail Only: Jill.Gormley@fresno.gov

Subject: Draft Scope of Work for the Preparation of a Traffic Impact Analysis for the proposed Clovis Unified School District Fowler-McKinley Elementary School Project in the City of Fresno (JLB Project 004-059)

Dear Mrs. Gormley,

JLB Traffic Engineering, Inc. (JLB) hereby submits this Draft Scope of Work for the preparation of a Traffic Impact Analysis (TIA) for the Clovis Unified School District (District) Fowler-McKinley Elementary School (Project) located on the northeast corner of the McKinley Avenue alignment and Fowler Avenue in the County of Fresno, but includes annexation of the site to the City of Fresno. Therefore, off-site improvements are proposed to follow City of Fresno standards. The Project proposes to build an Elementary School with approximately 28 classrooms, administrative offices, a multi-purpose building, hardcourt areas and athletic fields that could potentially be lighted. The Project is estimated to serve up to 750 students in kindergarten through sixth grades. The timing for construction of the Project is dependent on enrollment growth and funding availability, but the District estimates that the school could be constructed in approximately five years. An aerial of the Project vicinity and site is shown in Exhibit A.

The purpose of this TIA is to evaluate the potential on- and off-site traffic impacts, identify short-term roadway and circulation needs, determine potential mitigation measures, and identify any critical traffic issues that should be addressed in the on-going planning process. In order to evaluate the on- and off-site traffic impacts of the proposed Project, JLB proposes the following Draft Scope of Work.

Scope of Work

- Request a Fresno Council of Governments (Fresno COG) traffic forecast model run for the Project (Select Zone Analysis), which will include the Project and the streets to be analyzed. The Fresno COG traffic forecasting model will be used to forecast traffic volumes for the Existing plus Project and Cumulative Year 2035 plus Project Traffic Conditions scenarios.
- JLB will evaluate existing and forecast levels of service (LOS) at the study intersection(s). JLB will use HCM 2010 methodologies within Synchro to perform this analysis for the AM and PM peak hours. JLB will identify the causes of poor LOS.
- As necessary, JLB will obtain recent (less than two years) or schedule and conduct new traffic counts at the study facility(ies).

- JLB will perform a site visit to observe existing traffic conditions, especially during the AM and PM peak hours. Existing roadway conditions including geometrics and traffic controls will be verified.
- JLB will prepare California Manual on Uniform Traffic Control Devices (CA MUTCD) peak hour signal warrants for un-signalized study intersections.
- JLB will forecast trip distribution based on turn count information, anticipated school boundary, student population densities and the existing circulation network in the vicinity of the Project.
- JLB will qualitatively analyze existing and planned transit routes in vicinity of the Project.
- JLB will qualitatively analyze existing and planned bikeways in the vicinity of the Project.
- JLB, in consultation with Odell Planning & Research, Inc., will identify the non-busing service boundary for elementary school students. Using the no-busing boundaries, JLB will conduct a qualitative safe routes to school evaluation. The safe routes to school evaluation will be prepared based on information to be provided by the School District and field surveys to be conducted by JLB. Based on the above information, JLB will provide suggested Safe Routes to School recommendations.

Study Scenarios:

1. Existing Traffic Conditions with proposed improvement measures (if any);
2. Existing plus Project Traffic Conditions with proposed mitigation measures (if any);
3. Near Term plus Project Traffic Conditions (include pending and approved projects) with mitigation measures (if any);
4. Cumulative Year 2035 No Project Traffic Conditions with proposed improvement measures (if any); and
5. Cumulative Year 2035 plus Project Traffic Conditions with mitigation measures (if any).

Weekday (Monday, Tuesday or Wednesday only) peak hours to be analyzed:

1. 7-9 AM peak hour
2. 2-4 PM peak hour (to coincide with the school's peak traffic activities)

JLB proposes to analyze the PM peak hour of the generator (the school) between 2-4 PM.

Study Intersections (Normal Weekday Operations):

1. Clinton Avenue / Fowler Avenue
2. Kerry Avenue (future) / Fowler Avenue
3. McKinley Avenue (future) / Fowler Avenue
4. Floradora Avenue / Fowler Avenue
5. Olive Avenue / Fowler Avenue

Sim Traffic queuing analysis is included in the proposed scope of work for the study intersection(s) listed above under all study scenarios. This analysis will be utilized to recommend minimum storage lengths for left- and right-turn lanes at all study intersections.

Study Segments (Normal Weekday Operations Only):

1. McKinley Avenue between Fowler Avenue and Armstrong Avenue (future)

Project Only Trip Assignment to Caltrans Facilities:

1. State Route 180 / Fowler Avenue

Trip Generation

Table I provides the trip generation for the proposed Project during weekday operations pursuant to the 10th Edition of the Trip Generation Manual. At build-out, the Project is estimated to generate a maximum of 1,418 daily trips, 503 AM peak hour trips and 255 PM peak hour trips.

Table I: Weekday Operations - Project Only Trip Generation

			Daily		*(7-9) AM Peak Hour*						*(2-4) PM Peak Hour*					
Land Use (ITE Code)	*Size*	*Unit*	*Rate*	*Total*	*Trip Rate*	*In %*	*Out %*	*In*	*Out*	*Total*	*Trip Rate*	*In %*	*Out %*	*In*	*Out*	*Total*
Elementary School (520)	750	students	1.89	1,418	0.67	54	46	272	231	503	0.34	45	55	115	140	255
Total Project Trips				**1,418**				**272**	**231**	**503**				**115**	**140**	**255**

Near Term Projects to be Included

Based on our local knowledge of the study area and consultation with the City of Fresno Development and Resource Management staff, JLB proposes to include projects in the vicinity of the proposed Project under the Near Term plus Project Traffic Conditions analysis. The projects proposed to be included in the Near Term plus Project Traffic Conditions scenario are the following:

<u>Project Name</u>	<u>General Location</u>
1. TT 5171 (portion of)	SWQ Church Avenue and Clovis Avenue
2. TT 5341 (portion of)	SWC Clinton Avenue and Locan Avenue
3. TT 5424	NWQ Clinton Avenue and Temperance Avenue
4. TT 5427	SWC Dakota Avenue and Temperance Avenue
5. TT 5464	SWC Hamilton Avenue and Temperance Avenue
6. TT 5498	NEC Church Avenue and Peach Avenue
7. TT 5531 (portion of)	SEC California Avenue and Armstrong Avenue
8. TT 5592	SWC Shields Avenue and Locan Avenue
9. TT 5605 (portion of)	SWQ Ashlan Avenue and DeWolf Avenue
10. TT 5626 (portion of)	SEC Hamilton Avenue and Fowler Avenue
11. TT 5638	NWC Church Avenue and Armstrong Avenue
12. TT 5717 (portion of)	NEC Clinton Avenue and Fowler Avenue
13. TT 5913	NEC California Avenue and Armstrong Avenue
14. TT 5953	NEC Butler Avenue and Armstrong Avenue
15. TT 5998 (portion of)	NEC Dakota Avenue and Leonard Avenue
16. TT 6067 (portion of)	SEQ Dakota Avenue alignment and Locan Avenue
17. TT 6095 (portion of)	NEQ Church Avenue and Armstrong Avenue
18. TT 6101	SEC Dakota Avenue alignment and Leonard Avenue
19. TT 6107 (portion of)	SWQ Shaw Avenue and Highland Avenue
20. TT 6112 (portion of)	NWQ Dakota Avenue alignment and Temperance Avenue
21. TT 6114 (portion of)	NWQ Dakota Avenue alignment and Leonard Avenue
22. TT 6143 (portion of)	NEQ Dakota Avenue alignment and Leonard Avenue
23. TT 6214	SEQ Clinton Avenue and Fowler Avenue
24. Fancher Creek Town Center (portion of)	SEQ SR 180 and Clovis Avenue
25. Neighborhood Shopping Center (portion of)	SWC Shields Avenue and Armstrong Avenue
26. Sunnyside Market	NEQ Belmont Avenue and Temperance Avenue
27. CUSD Elementary School	NEQ Shields Avenue and Locan Avenue

The above scope of work is based on our understanding of this Project and our experience with similar Traffic Impact Analysis projects. In the absence of comments by April 4, 2018, it will be assumed that the above scope of work is acceptable to the agency(ies) that have not submitted any comments to the proposed TIA scope of work.

If you have any questions or require additional information, please contact me by phone at (559) 570-8991 or by e-mail at smaciel@JLBtraffic.com.

Sincerely,

Susana Maciel

Susana Maciel, EIT
Engineer I/II
JLB Traffic Engineering, Inc.
Traffic Engineering, Transportation Planning & Parking Solutions
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www.JLBtraffic.com

cc: Harpreet Kooner, County of Fresno
Tong Xiong, County of Fresno
David Padilla, Caltrans District 6
Jose Luis Benavides, JLB Traffic Engineering, Inc.

Z:\01 Projects\004 Fresno\004-059 Fowler McKinley ES TIA\Draft Scope of Work\L03142018 Draft Scope of Work.docx

Exhibit A – Project Vicinity & Site

Susana Maciel

From: Padilla, Dave@DOT <dave.padilla@dot.ca.gov>
Sent: Wednesday, March 14, 2018 1:31 PM
To: Susana Maciel; Jill Gormley (Jill.Gormley@fresno.gov)
Cc: hkooner (HKooner@co.fresno.ca.us); Tong Xiong (tonxiong@co.fresno.ca.us); Jose Benavides
Subject: RE: CUSD Fowler-McKinley Elementary School TIA - Draft Scope of Work

Hello Susana,

We have no concerns with the SOW. Please have a copy of the TIA sent to Caltrans for our review.

Thank you

David Padilla, Associate Transportation Planner
Office of Planning & Local Assistance
1352 W. Olive Avenue
Fresno, CA 93778-2616
Office: (559) 444-2493, Fax: (559) 445-5875
District 6

From: Susana Maciel [mailto:smaciel@jlbtraffic.com]
Sent: Wednesday, March 14, 2018 10:16 AM
To: Jill Gormley (Jill.Gormley@fresno.gov) <Jill.Gormley@fresno.gov>
Cc: hkooner (HKooner@co.fresno.ca.us) <HKooner@co.fresno.ca.us>; Tong Xiong (tonxiong@co.fresno.ca.us) <tonxiong@co.fresno.ca.us>; Padilla, Dave@DOT <dave.padilla@dot.ca.gov>; Jose Benavides <jbenavides@jlbtraffic.com>
Subject: CUSD Fowler-McKinley Elementary School TIA - Draft Scope of Work

Hello Mrs. Gormley,

Attached you will find a Draft Scope of Work for the preparation of a Traffic Impact Analysis for a Project in the City of Fresno. I kindly ask that you take a moment to review and comment on the proposed Scope of Work.

In the absence of comments by April 4, 2018, it will be assumed that the proposed Scope of Work is acceptable to the agency(ies) that have not submitted any comments.

Please do not hesitate to contact me if you have any questions or require any additional information. I can be reached by phone at 559.570.8991 or by email at smaciel@jlbtraffic.com. I sincerely appreciate your time and attention to this matter and look forward to hearing from you soon.

Best,

Susana Maciel, EIT
Engineer I/II
JLB Traffic Engineering, Inc.
1300 E. Shaw Ave., Ste. 103
Fresno, CA 93710

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E-mail: smaciel@JLBtraffic.com
Web: www.JLBtraffic.com

Susana Maciel

From: Xiong, Tong (PWP) <tonxiong@co.fresno.ca.us>
Sent: Monday, April 02, 2018 9:28 AM
To: Susana Maciel
Cc: Kooner, Harpreet; David Padilla (dave_padilla@dot.ca.gov); Jose Benavides; Jill Gormley (Jill.Gormley@fresno.gov); Daniele, Frank
Subject: RE: CUSD Fowler-McKinley Elementary School TIA - Draft Scope of Work

Good afternoon Susan,

Thanks for giving Fresno County Transportation Planning the opportunity to review and provide comments on the draft traffic study scope of work for the proposed Clovis USD Fowler-McKinley Elementary School.

<u>Project Summary</u>
Project Description:

- Clovis Unified School District (District) proposes a new elementary school, Fowler-McKinley Elementary School (Project). The project includes annexation of the site to the City of Fresno. The proposed elementary school with approximately have 28 classrooms, administrative offices, a multi-purpose building, hardcourt areas and athletic fields that could potentially be lighted. The Project is estimated to serve up to 750 students in kindergarten through sixth grades.

Project Location:

- The project site located on the northeast corner of the McKinley Avenue alignment and Fowler Avenue in the County of Fresno.

<u>Comments</u>
At this time, without a clear understanding of the school boundary for the proposed school and without a project trip distribution figure, Fresno County Transportation Planning is generally acceptable to the intersections and roadway segments being proposed to be studied in the provided scope of work. However, based on the location of the project, general understanding of the number of trips the project may generate and not having a service area boundary for the school, the additional roadway segments and intersections listed below should be included in the traffic impact analysis as well.

Intersection

1. Floradora Avenue and Armstrong Avenue

Roadway Segment (Location/Agency Jurisdiction)

2. Clinton Avenue: Clovis Avenue to Temperance Avenue
3. Floradora/ McKinley alignment: Fowler Avenue to Temperance Avenue
4. Olive Avenue: Clovis Avenue to Temperance Avenue

Mitigation

1. Future Impacts – When a project causes a significant impact in the future scenario, the project will be asked to participate financially for the costs of the mitigation of cumulative impacts anticipated to be needed within the 20-year planning horizon to the extent of the project's fair share.

Because there is no trip distribution figure included in this preliminary review, be advised, Fresno County Transportation Planning may request additional intersections and roadway segments be studied in the traffic study, if necessary. The trip distribution should be routed to County for review. Should there be any traffic scoping meeting for this project, please include Fresno County staff. Please route a copy of the traffic study to County of Fresno Transportation Planning for review once it becomes available.

Below are comments from Fresno County Road Maintenance, maybe your applicant or the City can clarify.

1. Scope says NE corner of Fowler/McKinley will be annexed into the City of Fresno. However, this property is not adjacent to City of Fresno city limits. What other properties are going to be included in the annexation to provide continuity of city limit lines?
2. The exhibit needs to show the site area boundary that the school will serve to help identify where traffic will originate.
3. The exhibit also needs to show the proposed roadway circulation in and around the school site, i.e. what new streets will be built around the school?
4. The intersection of Fowler/McKinley and the road segment of McKinley from Fowler to Armstrong are not shown in the City of Fresno Circulation Element. Is a General Plan Amendment also being proposed with the school project to amend the City's Circulation Element?
5. Clinton Avenue between Clovis and Temperance is shown as a 4-lane facility in the City's Circulation Element. It is currently a 2-lane roadway. The study should also analyze the LOS of Clinton Avenue between Clovis and Temperance.
6. The City's Circulation Element shows a 2-lane collector road running east starting at the Fowler/Floradora intersection. The LOS at that intersection and for the road segment as shown on the Floradora/McKinley alignment from Fowler to Temperance should also be analyzed, along with the Floradora/Armstrong intersection.
7. Olive Avenue between Clovis and Temperance is also shown as a 4-lane road in the City's Circulation Element. Depending on the service area boundary for the school site, the Olive Avenue roadway segment from Clovis to Temperance may also need to be studied. FYI – That roadway segment also includes the Olive/Armstrong intersection, but there is an existing Clovis USD elementary school at that corner. The exhibits needs to show the boundary line limits for these two elementary schools.

Best regards,

Tong Xiong

Design Division
Department of Public Works and Planning
2220 Tulare Street, 7th Floor
Fresno, CA 93721
Tel: (559) 600-4532
E-mail: tonxiong@co.fresno.ca.us

From: Susana Maciel <smaciel@jlbtraffic.com>
Sent: Wednesday, March 14, 2018 10:16 AM
To: Jill Gormley (Jill.Gormley@fresno.gov) <Jill.Gormley@fresno.gov>
Cc: Kooner, Harpreet <HKooner@co.fresno.ca.us>; Xiong, Tong (PWP) <tonxiong@co.fresno.ca.us>; David Padilla

(dave_padilla@dot.ca.gov) <dave_padilla@dot.ca.gov>; Jose Benavides <jbenavides@jlbtraffic.com>
Subject: CUSD Fowler-McKinley Elementary School TIA - Draft Scope of Work

Hello Mrs. Gormley,

Attached you will find a Draft Scope of Work for the preparation of a Traffic Impact Analysis for a Project in the City of Fresno. I kindly ask that you take a moment to review and comment on the proposed Scope of Work.

In the absence of comments by April 4, 2018, it will be assumed that the proposed Scope of Work is acceptable to the agency(ies) that have not submitted any comments.

Please do not hesitate to contact me if you have any questions or require any additional information. I can be reached by phone at 559.570.8991 or by email at smaciel@jlbtraffic.com. I sincerely appreciate your time and attention to this matter and look forward to hearing from you soon.

Best,

Susana Maciel, EIT
Engineer I/II
JLB Traffic Engineering, Inc.
1300 E. Shaw Ave., Ste. 103
Fresno, CA 93710
Office: 559.570.8991
Cell: 559.232.9474
E-mail: smaciel@JLBtraffic.com
Web: www.JLBtraffic.com

Susana Maciel

From:	Jill Gormley <Jill.Gormley@fresno.gov>
Sent:	Tuesday, April 03, 2018 6:30 PM
To:	Susana Maciel
Cc:	hkooner (HKooner@co.fresno.ca.us); Tong Xiong (tonxiong@co.fresno.ca.us); David Padilla (dave_padilla@dot.ca.gov); Jose Benavides
Subject:	RE: CUSD Fowler-McKinley Elementary School TIA - Draft Scope of Work

Hi Susana,

Please include the typical PM peak hour in the study.

Crossings at schools has been a constant topic. Please also include analysis for a midblock crossing on McKinley that would include either a HAWK or traffic signal.

Please let me know if you have any questions.

jmg

From: Susana Maciel [mailto:smaciel@jlbtraffic.com]
Sent: Monday, April 02, 2018 1:54 PM
To: Jill Gormley
Cc: hkooner (HKooner@co.fresno.ca.us); Tong Xiong (tonxiong@co.fresno.ca.us); David Padilla (dave_padilla@dot.ca.gov); Jose Benavides
Subject: RE: CUSD Fowler-McKinley Elementary School TIA - Draft Scope of Work

Good afternoon Mrs. Gormley,

I wanted to take a moment to follow up with you as our proposed deadline for comments to this Draft Scope of Work is approaching soon.

At this point, we have received comments from Caltrans and the County of Fresno only.

Please do not hesitate to contact me if you have any questions or require any additional information.

I look forward to hearing from you soon.

Best,

Susana Maciel, EIT
Engineer I/II
JLB Traffic Engineering, Inc.
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Office: 559.570.8991
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From: Susana Maciel
Sent: Wednesday, March 14, 2018 10:16 AM
To: 'Jill Gormley (Jill.Gormley@fresno.gov)' <Jill.Gormley@fresno.gov>
Cc: hkooner (HKooner@co.fresno.ca.us) <HKooner@co.fresno.ca.us>; Tong Xiong (tonxiong@co.fresno.ca.us) <tonxiong@co.fresno.ca.us>; David Padilla (dave_padilla@dot.ca.gov) <dave_padilla@dot.ca.gov>; Jose Benavides <jbenavides@jlbtraffic.com>
Subject: CUSD Fowler-McKinley Elementary School TIA - Draft Scope of Work

Hello Mrs. Gormley,

Attached you will find a Draft Scope of Work for the preparation of a Traffic Impact Analysis for a Project in the City of Fresno. I kindly ask that you take a moment to review and comment on the proposed Scope of Work.

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Please do not hesitate to contact me if you have any questions or require any additional information. I can be reached by phone at 559.570.8991 or by email at smaciel@jlbtraffic.com. I sincerely appreciate your time and attention to this matter and look forward to hearing from you soon.

Best,

Susana Maciel, EIT
Engineer I/II
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Web: www.JLBtraffic.com

Jose Benavides

From: Xiong, Tong (PWP) <tonxiong@co.fresno.ca.us>
Sent: Friday, April 27, 2018 9:19 AM
To: Jose Benavides
Subject: RE: Fowler - McKinley Elementary School PM Peak Hours

Jose,

Yes that is correct. Thanks for catching that mistake.

Regards,

Tong Xiong

Design Division
Department of Public Works and Planning
2220 Tulare Street, 7th Floor
Fresno, CA 93721
Tel: (559) 600-4532
E-mail: tonxiong@co.fresno.ca.us

From: Jose Benavides <jbenavides@jlbtraffic.com>
Sent: Friday, April 27, 2018 9:19 AM
To: Xiong, Tong (PWP) <tonxiong@co.fresno.ca.us>
Subject: RE: Fowler - McKinley Elementary School PM Peak Hours

Good morning Tong,

I believe that for this school as well you meant to say 4-6 pm correct?

Sincerely,

Jose Luis Benavides, P.E., T.E.
President

JLB Traffic Engineering, Inc.

Traffic Engineering, Transportation Planning and Parking Solutions
Certified Disadvantaged Business Enterprise (DBE) and Small Business Enterprise (SBE)

1300 E. Shaw Ave., Ste. 103
Fresno, CA 93710

Office: (559) 570-8991
Cell: (559) 694-6000
www.JLBtraffic.com

From: Xiong, Tong (PWP) <tonxiong@co.fresno.ca.us>
Sent: Thursday, April 19, 2018 2:14 PM
To: Jose Benavides <jbenavides@jlbtraffic.com>
Cc: Kooner, Harpreet <HKooner@co.fresno.ca.us>; Daniele, Frank <FDaniele@co.fresno.ca.us>
Subject: Fowler - McKinley Elementary School PM Peak Hours

Jose,

Thanks for the call regarding the City of Fresno's comment to study the PM peak hours from 4-7 pm instead of the 2-4 pm peak hours proposed in your draft traffic scoping document for the proposed Fowler – McKinley Elementary School. Fresno County Transportation Planning is in agreement with the City of Fresno's comment to study the PM Peak hours of 4 p.m. to 7 p.m.

Regards,

Tong Xiong
Design Division
Department of Public Works and Planning
2220 Tulare Street, 7th Floor
Fresno, CA 93721
Tel: (559) 600-4532
E-mail: tonxiong@co.fresno.ca.us

Appendix B: Traffic Counts

JLB Traffic Engineering, Inc.

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www.JLBtraffic.com

File Name : Fowler at Clinton
Site Code : 00012318
Start Date : 1/23/2018
Page No : 1

Groups Printed- Unshifted - Bank 1

	Fowler Ave Southbound					Clinton Ave Westbound					Fowler Ave Northbound					Clinton Ave Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	3	102	35	0	140	12	16	0	0	28	18	83	4	0	105	10	6	4	0	20	293
07:15 AM	2	113	50	0	165	8	30	6	0	44	20	79	8	0	107	7	21	10	0	38	354
07:30 AM	5	100	50	0	155	7	50	11	0	68	16	59	2	0	77	9	13	12	0	34	334
07:45 AM	7	79	61	0	147	10	52	5	0	67	22	85	5	0	112	16	19	5	0	40	366
Total	17	394	196	0	607	37	148	22	0	207	76	306	19	0	401	42	59	31	0	132	1347
08:00 AM	4	102	49	0	155	7	37	17	0	61	14	72	8	0	94	6	16	8	0	30	340
08:15 AM	4	107	32	0	143	10	27	9	0	46	8	57	3	0	68	5	11	10	0	26	283
08:30 AM	0	99	21	0	120	11	22	0	0	33	15	55	4	0	74	11	7	5	0	23	250
08:45 AM	2	72	19	0	93	5	9	4	0	18	9	58	4	0	71	5	5	5	0	15	197
Total	10	380	121	0	511	33	95	30	0	158	46	242	19	0	307	27	39	28	0	94	1070
******																					
04:00 PM	8	89	19	0	116	5	14	5	0	24	6	102	5	0	113	22	30	20	0	72	325
04:15 PM	4	84	12	0	100	0	6	2	0	8	9	108	3	0	120	16	24	24	0	64	292
04:30 PM	6	94	15	0	115	6	12	2	0	20	9	100	5	0	114	30	41	21	0	92	341
04:45 PM	4	87	12	0	103	1	13	4	0	18	6	117	4	0	127	22	38	15	0	75	323
Total	22	354	58	0	434	12	45	13	0	70	30	427	17	0	474	90	133	80	0	303	1281
05:00 PM	11	85	17	0	113	2	13	4	0	19	8	107	3	0	118	37	54	19	0	110	360
05:15 PM	16	92	13	0	121	4	11	5	0	20	2	104	10	0	116	24	38	14	0	76	333
05:30 PM	6	86	10	0	102	1	8	4	0	13	3	114	9	0	126	19	35	13	0	67	308
05:45 PM	4	82	13	0	99	6	4	1	0	11	7	115	8	0	130	14	18	7	0	39	279
Total	37	345	53	0	435	13	36	14	0	63	20	440	30	0	490	94	145	53	0	292	1280
Grand Total	86	1473	428	0	1987	95	324	79	0	498	172	1415	85	0	1672	253	376	192	0	821	4978
Apprch %	4.3	74.1	21.5	0		19.1	65.1	15.9	0		10.3	84.6	5.1	0		30.8	45.8	23.4	0		
Total %	1.7	29.6	8.6	0	39.9	1.9	6.5	1.6	0	10	3.5	28.4	1.7	0	33.6	5.1	7.6	3.9	0	16.5	
Unshifted	66	1473										1415									
% Unshifted	76.7	100	100	0	99	100	100	100	0	100	100	100	100	0	100	100	100	100	0	100	99.6
Bank 1	20	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
% Bank 1	23.3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4

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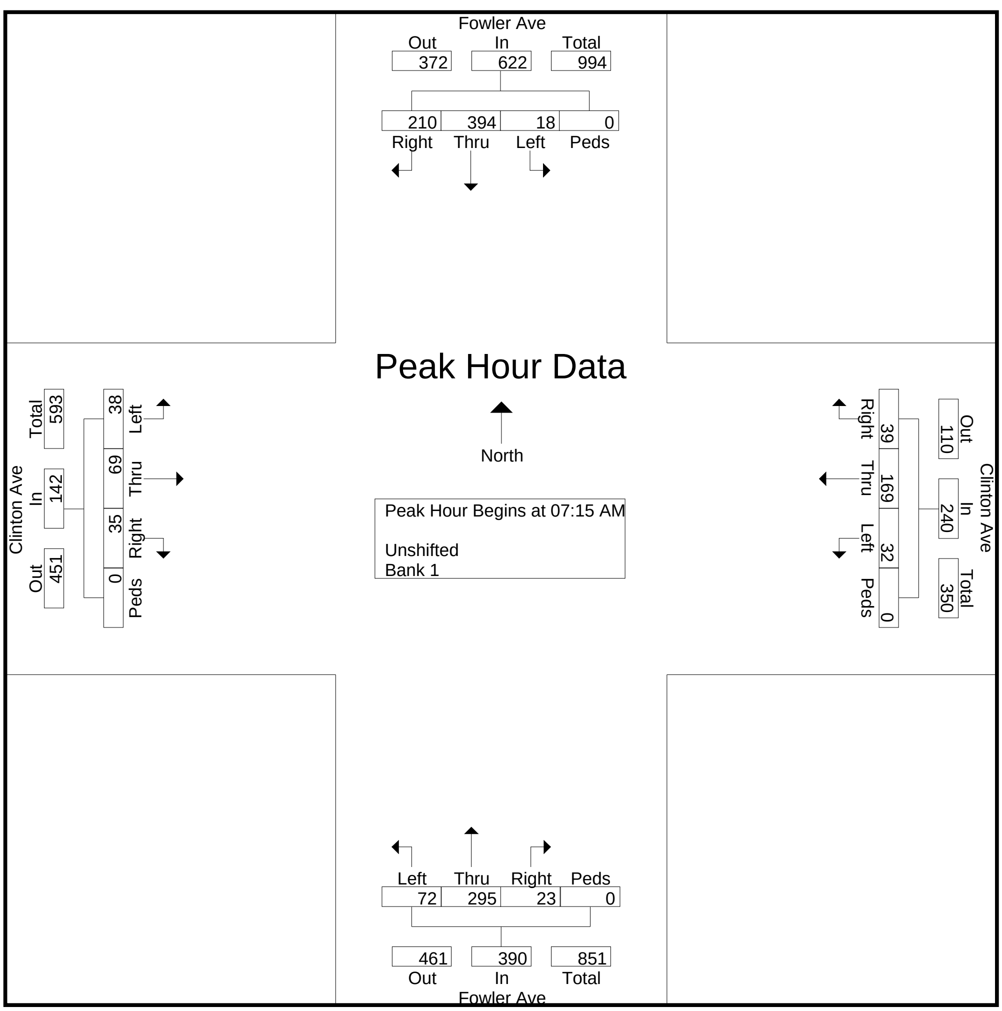
File Name : Fowler at Clinton
Site Code : 00012318
Start Date : 1/23/2018
Page No : 2

	Fowler Ave Southbound					Clinton Ave Westbound					Fowler Ave Northbound					Clinton Ave Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	2	**113**	50	0	**165**	8	30	6	0	44	20	79	**8**	0	107	7	**21**	10	0	38	354
07:30 AM	5	100	50	0	155	7	50	11	0	**68**	16	59	2	0	77	9	13	**12**	0	34	334
07:45 AM	**7**	79	**61**	0	147	**10**	**52**	5	0	67	**22**	**85**	5	0	**112**	**16**	19	5	0	**40**	**366**
08:00 AM	4	102	49	0	155	7	37	**17**	0	61	14	72	8	0	94	6	16	8	0	30	340
Total Volume	18	394	210	0	622	32	169	39	0	240	72	295	23	0	390	38	69	35	0	142	1394
% App. Total	2.9	63.3	33.8	0		13.3	70.4	16.2	0		18.5	75.6	5.9	0		26.8	48.6	24.6	0		
PHF	.643	.872	.861	.000	.942	.800	.813	.574	.000	.882	.818	.868	.719	.000	.871	.594	.821	.729	.000	.888	.952



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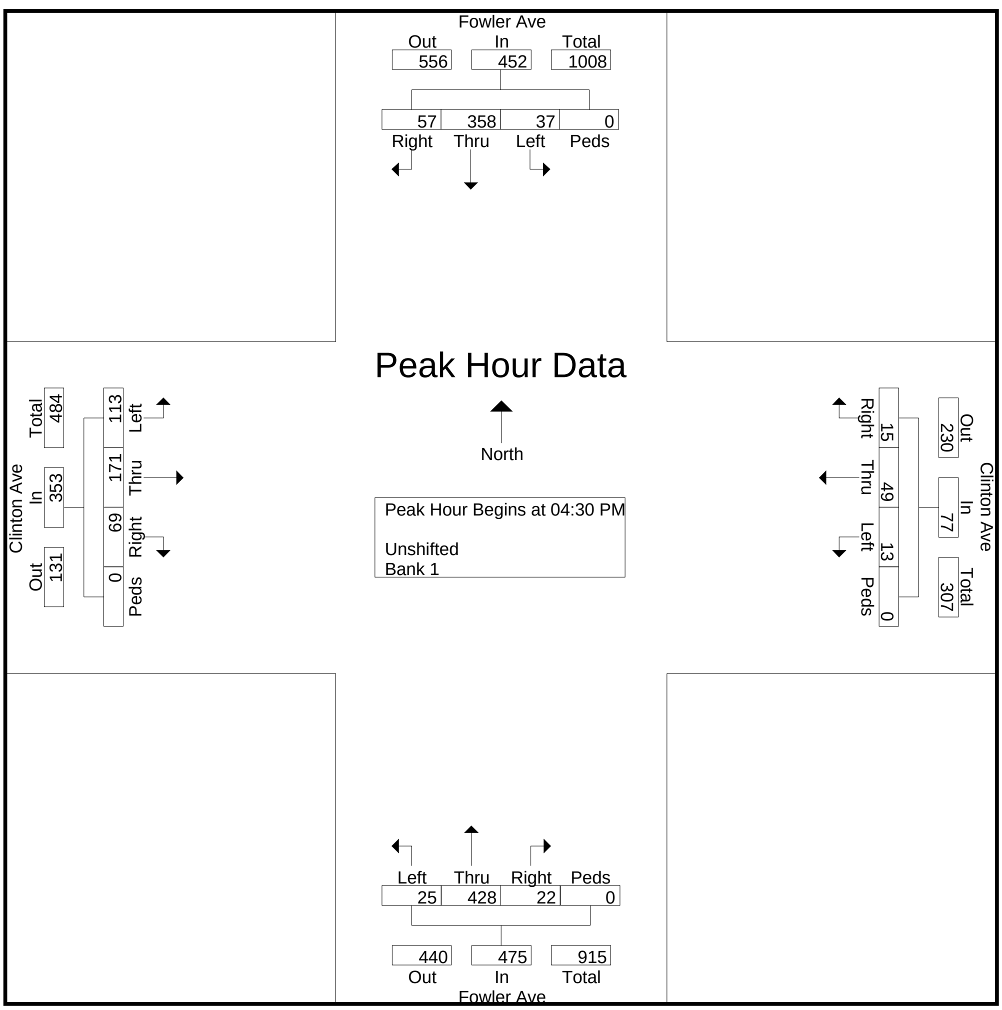
File Name : Fowler at Clinton
Site Code : 00012318
Start Date : 1/23/2018
Page No : 3

	Fowler Ave Southbound					Clinton Ave Westbound					Fowler Ave Northbound					Clinton Ave Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	6	**94**	15	0	115	**6**	12	2	0	**20**	**9**	100	5	0	114	30	41	**21**	0	92	341
04:45 PM	4	87	12	0	103	1	**13**	4	0	18	6	**117**	4	0	**127**	22	38	15	0	75	323
05:00 PM	11	85	**17**	0	113	2	13	4	0	19	8	107	3	0	118	**37**	**54**	19	0	**110**	**360**
05:15 PM	**16**	92	13	0	**121**	4	11	**5**	0	20	2	104	**10**	0	116	24	38	14	0	76	333
Total Volume	37	358	57	0	452	13	49	15	0	77	25	428	22	0	475	113	171	69	0	353	1357
% App. Total	8.2	79.2	12.6	0		16.9	63.6	19.5	0		5.3	90.1	4.6	0		32	48.4	19.5	0		
PHF	.578	.952	.838	.000	.934	.542	.942	.750	.000	.963	.694	.915	.550	.000	.935	.764	.792	.821	.000	.802	.942



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File Name : Fowler at Clinton
Site Code : 00012318
Start Date : 1/23/2018
Page No : 1

Groups Printed- Bank 1

	Fowler Ave Southbound					Clinton Ave Westbound					Fowler Ave Northbound					Clinton Ave Eastbound					
Start Time	U-turn	Thru	Right	Ped	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
******																					
07:45 AM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
******																					
04:00 PM	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
******																					
04:30 PM	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
04:45 PM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	6	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
05:00 PM	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
05:15 PM	6	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
05:30 PM	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
05:45 PM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	12	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
Grand Total	20	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
Apprch %	100	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %	100	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

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File Name : Fowler at Floradora
Site Code : 00012418
Start Date : 1/24/2018
Page No : 1

Groups Printed- Unshifted - Bank 1

	Fowler Ave Southbound					Floradora Ave Westbound					Fowler Ave Northbound					Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	1	104	0	0	105	3	0	0	0	3	0	85	8	0	93	0	0	0	0	0	201
07:15 AM	0	132	0	0	132	5	0	0	0	5	0	80	1	0	81	0	0	0	0	0	218
07:30 AM	6	109	0	0	115	2	0	1	0	3	0	101	2	0	103	0	0	0	0	0	221
07:45 AM	8	95	0	0	103	3	0	1	0	4	0	101	4	0	105	0	0	0	0	0	212
Total	15	440	0	0	455	13	0	2	0	15	0	367	15	0	382	0	0	0	0	0	852
08:00 AM	1	98	0	0	99	3	0	4	0	7	0	79	3	0	82	0	0	0	0	0	188
08:15 AM	2	104	0	0	106	0	0	2	0	2	0	94	4	0	98	0	0	0	0	0	206
08:30 AM	2	97	0	0	99	1	0	2	0	3	0	65	1	0	66	0	0	0	0	0	168
08:45 AM	0	73	0	0	73	3	0	0	0	3	0	55	2	0	57	0	0	0	0	0	133
Total	5	372	0	0	377	7	0	8	0	15	0	293	10	0	303	0	0	0	0	0	695
******																					
04:00 PM	1	124	0	0	125	0	0	0	0	0	0	101	2	0	103	0	0	0	0	0	228
04:15 PM	2	111	0	0	113	3	0	2	0	5	0	127	2	0	129	0	0	0	0	0	247
04:30 PM	0	116	0	0	116	1	0	4	0	5	0	113	1	0	114	0	0	0	0	0	235
04:45 PM	0	112	0	0	112	1	0	2	0	3	0	116	3	0	119	0	0	0	0	0	234
Total	3	463	0	0	466	5	0	8	0	13	0	457	8	0	465	0	0	0	0	0	944
05:00 PM	0	134	0	0	134	6	0	2	0	8	0	114	3	0	117	0	0	0	0	0	259
05:15 PM	3	136	0	0	139	1	0	2	0	3	0	118	1	0	119	0	0	0	0	0	261
05:30 PM	0	114	0	0	114	1	0	1	0	2	0	114	3	0	117	0	0	0	0	0	233
05:45 PM	1	92	0	0	93	2	0	0	0	2	0	126	0	0	126	0	0	0	0	0	221
Total	4	476	0	0	480	10	0	5	0	15	0	472	7	0	479	0	0	0	0	0	974
Grand Total	27	1751	0	0	1778	35	0	23	0	58	0	1589	40	0	1629	0	0	0	0	0	3465
Apprch %	1.5	98.5	0	0		60.3	0	39.7	0		0	97.5	2.5	0		0	0	0	0		
Total %	0.8	50.5	0	0	51.3	1	0	0.7	0	1.7	0	45.9	1.2	0	47	0	0	0	0	0	
Unshifted	27	1751										1589									
% Unshifted	100	100	0	0	100	100	0	100	0	100	0	100	100	0	100	0	0	0	0	0	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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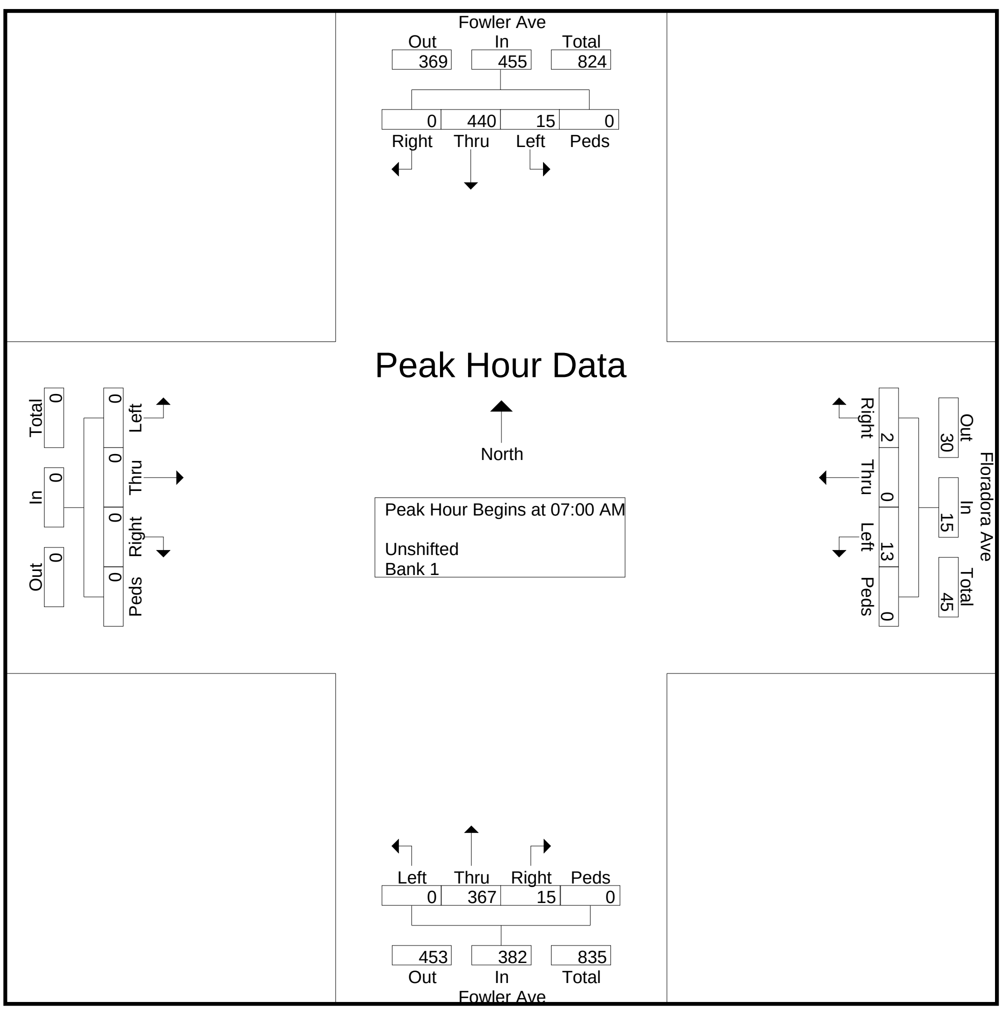
File Name : Fowler at Floradora
Site Code : 00012418
Start Date : 1/24/2018
Page No : 2

	Fowler Ave Southbound					Floradora Ave Westbound					Fowler Ave Northbound					Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	1	104	0	0	105	3	0	0	0	3	0	85	**8**	0	93	0	0	0	0	0	201
07:15 AM	0	**132**	0	0	**132**	**5**	0	0	0	**5**	0	80	1	0	81	0	0	0	0	0	218
07:30 AM	6	109	0	0	115	2	0	**1**	0	3	0	**101**	2	0	103	0	0	0	0	0	**221**
07:45 AM	**8**	95	0	0	103	3	0	1	0	4	0	101	4	0	**105**	0	0	0	0	0	212
Total Volume	15	440	0	0	455	13	0	2	0	15	0	367	15	0	382	0	0	0	0	0	852
% App. Total	3.3	96.7	0	0		86.7	0	13.3	0		0	96.1	3.9	0		0	0	0	0		
PHF	.469	.833	.000	.000	.862	.650	.000	.500	.000	.750	.000	.908	.469	.000	.910	.000	.000	.000	.000	.000	.964

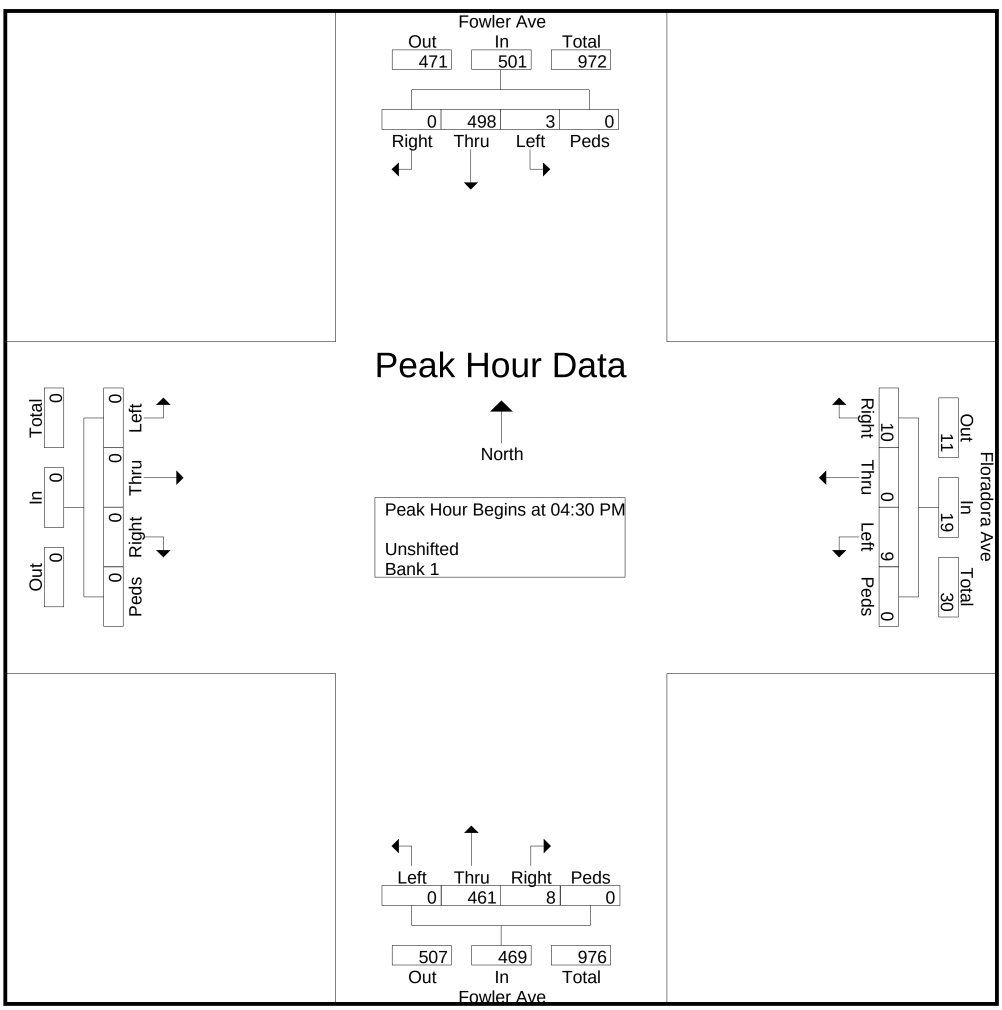


JLB Traffic Engineering, Inc.

1300 E. Shaw Ave., Ste. 103
Fresno, CA 93710
(559) 570-8991
Traffic Engineering, Transportation Planning & Parking Solutions
www.JLBtraffic.com

File Name : Fowler at Floradora
Site Code : 00012418
Start Date : 1/24/2018
Page No : 3

	Fowler Ave Southbound					Floradora Ave Westbound					Fowler Ave Northbound					Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	116	0	0	116	1	0	**4**	0	5	0	113	1	0	114	0	0	0	0	0	235
04:45 PM	0	112	0	0	112	1	0	2	0	3	0	116	**3**	0	**119**	0	0	0	0	0	234
05:00 PM	0	134	0	0	134	**6**	0	2	0	**8**	0	114	3	0	117	0	0	0	0	0	259
05:15 PM	**3**	**136**	0	0	**139**	1	0	2	0	3	0	**118**	1	0	119	0	0	0	0	0	**261**
Total Volume	3	498	0	0	501	9	0	10	0	19	0	461	8	0	469	0	0	0	0	0	989
% App. Total	0.6	99.4	0	0		47.4	0	52.6	0		0	98.3	1.7	0		0	0	0	0		
PHF	.250	.915	.000	.000	.901	.375	.000	.625	.000	.594	.000	.977	.667	.000	.985	.000	.000	.000	.000	.000	.947



Prepared by National Data & Surveying Services

Fowler Ave & Olive Ave

Peak Hour Turning Movement Count

ID: 18-02013-001
City: Fresno

Day: Thursday
Date: 01/25/2018

	AM	NOON	PM
PEAK HOURS	07:15 AM - 08:15 AM	NONE	03:30 PM - 04:30 PM
COUNT PERIODS	07:00 AM - 09:00 AM	NONE	02:00 PM - 06:00 PM

Fowler Ave – SOUTHBOUND

	U-Turn	Left	Thru	Right	Departing
AM	0	3	441	5	363
NOON	0	0	0	0	0
PM	0	3	470	13	466
Lanes	0	0	1	0	

Olive Ave – WESTBOUND

	Lanes	PM	NOON	AM
Right	0	7	0	0
Thru	1	47	0	110
Left	1	201	0	461
U-Turn	0	0	0	0
Departing		222	0	123

Olive Ave – EASTBOUND

	AM	NOON	PM	Lanes
Departing	130	0	66	
U-Turn	0	0	0	0
Left	17	0	24	1
Thru	38	0	62	1
Right	23	0	31	0

Fowler Ave – NORTHBOUND

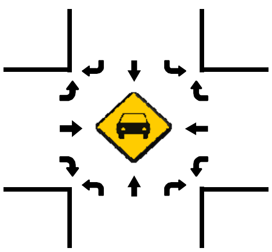
	Departing	U-Turn	Left	Thru	Right
Lanes		0	0	1	0
PM	702	0	6	435	157
NOON	0	0	0	0	0
AM	925	0	15	346	82

CONTROL

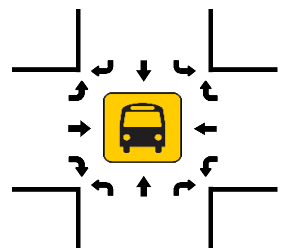
4-Way Stop

	AM	NOON	PM
TEV	1541	0	1456
PHF	0.97		0.91

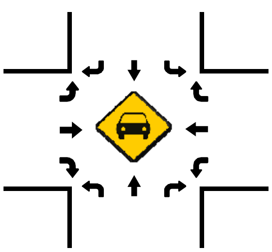
Total Vehicles (AM)



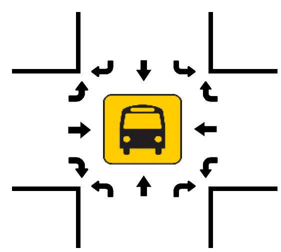
Total Vehicles (AM)



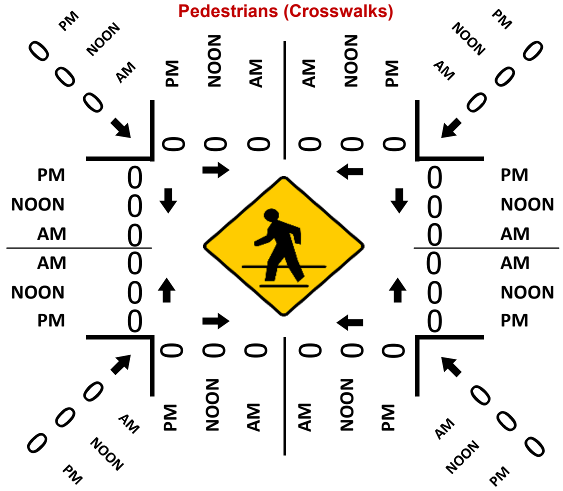
Total Vehicles (NOON)



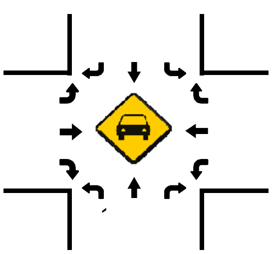
Total Vehicles (NOON)



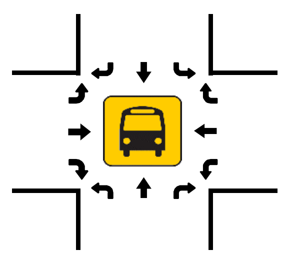
Pedestrians (Crosswalks)



Total Vehicles (PM)



Total Vehicles (PM)



National Data & Surveying Services Intersection Turning Movement Count

Location: Fowler Ave & Olive Ave
City: Fresno
Control: 4-Way Stop

Project ID: 18-02013-001
Date: 1/25/2018

Total

NS/EW Streets:	Fowler Ave				Fowler Ave				Olive Ave				Olive Ave				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	1	1	0	0	1	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
7:00 AM	5	86	30	0	1	89	0	0	1	11	3	0	95	6	2	0	329
7:15 AM	4	90	26	0	0	131	2	0	1	8	5	0	111	13	0	0	391
7:30 AM	4	82	19	0	1	96	1	0	5	10	8	0	122	24	0	0	372
7:45 AM	3	102	15	0	1	101	0	0	6	11	7	0	111	40	0	0	397
8:00 AM	4	72	22	0	1	113	2	0	5	9	3	0	117	33	0	0	381
8:15 AM	6	98	13	0	0	126	6	0	1	7	6	0	73	17	0	0	353
8:30 AM	3	77	13	0	3	99	2	0	3	3	4	0	56	9	1	0	273
8:45 AM	2	80	16	0	2	94	1	0	7	3	1	0	39	7	1	0	253
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	31	687	154	0	9	849	14	0	29	62	37	0	724	149	4	0	2749
APPROACH %'s :	3.56%	####	####	0.00%	1.03%	####	1.61%	0.00%	####	####	####	0.00%	####	####	0.46%	0.00%	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	15	346	82	0	3	441	5	0	17	38	23	0	461	110	0	0	1541
PEAK HR FACTOR :	0.938	0.848	0.788	0.000	0.750	0.842	0.625	0.000	0.708	0.864	0.719	0.000	0.945	0.688	0.000	0.000	0.970
	0.923				0.844				0.813				0.945				

	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
PM	0	1	0	0	0	1	0	0	1	1	0	0	1	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
2:00 PM	5	83	22	0	1	109	6	0	4	4	8	0	37	7	7	0	293
2:15 PM	4	117	28	0	2	83	2	0	5	9	5	0	29	6	0	0	290
2:30 PM	3	100	28	0	0	89	6	0	8	9	3	0	36	6	3	0	291
2:45 PM	3	113	30	0	2	108	5	0	6	7	4	0	39	11	1	0	329
3:00 PM	4	112	36	0	1	103	4	0	4	10	4	0	36	10	2	0	326
3:15 PM	2	105	27	0	3	106	2	0	8	15	3	0	57	26	6	0	360
3:30 PM	2	101	30	0	1	115	5	0	6	19	15	0	83	21	2	0	400
3:45 PM	1	114	37	0	1	124	3	0	9	12	6	0	45	10	1	0	363
4:00 PM	2	108	35	0	0	114	4	0	3	17	4	0	32	5	2	0	326
4:15 PM	1	112	55	0	1	117	1	0	6	14	6	0	41	11	2	0	367
4:30 PM	2	105	41	0	2	111	4	0	9	15	13	0	41	6	1	0	350
4:45 PM	5	108	44	0	2	97	2	0	5	20	9	0	33	3	0	0	328
5:00 PM	4	99	37	0	1	117	1	0	8	29	6	0	42	7	3	0	354
5:15 PM	2	110	57	0	1	123	2	0	6	25	4	0	26	4	1	0	361
5:30 PM	1	110	38	0	1	101	0	0	5	14	2	0	31	6	0	0	309
5:45 PM	2	107	49	0	0	104	0	0	3	11	3	0	35	6	0	0	320
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	43	1704	594	0	19	1721	47	0	95	230	95	0	643	145	31	0	5367
APPROACH %'s :	1.84%	72.79%	25.37%	0.00%	1.06%	96.31%	2.63%	0.00%	22.62%	54.76%	22.62%	0.00%	78.51%	17.70%	3.79%	0.00%	
PEAK HR :	03:30 PM - 04:30 PM																TOTAL
PEAK HR VOL :	6	435	157	0	3	470	13	0	24	62	31	0	201	47	7	0	1456
PEAK HR FACTOR :	0.750	0.954	0.714	0.000	0.750	0.948	0.650	0.000	0.667	0.816	0.517	0.000	0.605	0.560	0.875	0.000	0.910
	0.890				0.949				0.731				0.601				

Prepared by NDS/ATD

VOLUME

E Clinton Ave 1400' W/O N Fowler Ave

Day: Wednesday
Date: 4/25/2018

City: Fresno
Project #: CA18_2051_004

DAILY TOTALS	NB	SB	EB	WB	Total
	0	0	2,611	2,883	5,494

AM Period	NB		SB		EB		WB		TOTAL	
00:00					2		2		4	
00:15					5		0		5	
00:30					1		1		2	
00:45					2	10	0	3	2	13
01:00					1		1		2	
01:15					1		0		1	
01:30					1		5		6	
01:45					4	7	1	7	5	14
02:00					4		1		5	
02:15					1		0		1	
02:30					1		1		2	
02:45					3	9	0	2	3	11
03:00					2		3		5	
03:15					2		2		4	
03:30					3		3		6	
03:45					7	14	6	14	13	28
04:00					3		2		5	
04:15					5		6		11	
04:30					7		10		17	
04:45					19	34	19	37	38	71
05:00					10		11		21	
05:15					13		15		28	
05:30					16		23		39	
05:45					54	93	52	101	106	194
06:00					13		26		39	
06:15					23		33		56	
06:30					31		42		73	
06:45					42	109	72	173	114	282
07:00					50		63		113	
07:15					50		84		134	
07:30					43		114		157	
07:45					44	187	122	383	166	570
08:00					53		89		142	
08:15					28		71		99	
08:30					36		60		96	
08:45					27	144	49	269	76	413
09:00					26		47		73	
09:15					32		44		76	
09:30					35		37		72	
09:45					28	121	32	160	60	281
10:00					28		37		65	
10:15					28		37		65	
10:30					25		40		65	
10:45					43	124	34	148	77	272
11:00					39		48		87	
11:15					28		47		75	
11:30					43		41		84	
11:45					46	156	50	186	96	342
TOTALS						1008		1483		**2491**
SPLIT %						40.5%		59.5%		**45.3%**

PM Period	NB		SB		EB		WB		TOTAL	
12:00					48		47		95	
12:15					34		44		78	
12:30					52		58		110	
12:45					35	169	48	197	83	366
13:00					54		29		83	
13:15					47		39		86	
13:30					33		43		76	
13:45					34	168	55	166	89	334
14:00					35		51		86	
14:15					38		46		84	
14:30					41		54		95	
14:45					55	169	33	184	88	353
15:00					44		42		86	
15:15					60		57		117	
15:30					58		83		141	
15:45					68	230	60	242	128	472
16:00					67		72		139	
16:15					67		49		116	
16:30					100		49		149	
16:45					86	320	37	207	123	527
17:00					100		56		156	
17:15					67		31		98	
17:30					41		34		75	
17:45					39	247	27	148	66	395
18:00					40		20		60	
18:15					23		17		40	
18:30					16		19		35	
18:45					21	100	21	77	42	177
19:00					19		15		34	
19:15					17		18		35	
19:30					11		15		26	
19:45					20	67	10	58	30	125
20:00					18		14		32	
20:15					19		13		32	
20:30					17		11		28	
20:45					9	63	17	55	26	118
21:00					7		8		15	
21:15					11		8		19	
21:30					11		13		24	
21:45					2	31	12	41	14	72
22:00					8		7		15	
22:15					4		4		8	
22:30					9		2		11	
22:45					4	25	4	17	8	42
23:00					6		4		10	
23:15					4		1		5	
23:30					2		2		4	
23:45					2	14	1	8	3	22
TOTALS						1603		1400		**3003**
SPLIT %						53.4%		46.6%		**54.7%**

DAILY TOTALS	NB	SB	EB	WB	Total
	0	0	2,611	2,883	5,494

	NB	SB	EB	WB	Total		NB	SB	EB	WB	Total
AM Peak Hour			07:15	07:15	**07:15**	**PM Peak Hour**			16:15	15:15	**16:15**
AM Pk Volume			190	409	**599**	**PM Pk Volume**			353	272	**544**
Pk Hr Factor			0.896	0.838	**0.902**	**Pk Hr Factor**			0.883	0.819	**0.872**
7 - 9 Volume	0	0	331	652	**983**	**4 - 6 Volume**	0	0	567	355	**922**
7 - 9 Peak Hour			07:15	07:15	**07:15**	**4 - 6 Peak Hour**			16:15	16:00	**16:15**
7 - 9 Pk Volume	0	0	190	409	**599**	**4 - 6 Pk Volume**	0	0	353	207	**544**
Pk Hr Factor	0.000	0.000	0.896	0.838	**0.902**	**Pk Hr Factor**	0.000	0.000	0.883	0.719	**0.872**

Prepared by NDS/ATD

VOLUME

Clinton Ave Bet. Fowler Ave & Armstrong Ave

Day: Thursday
Date: 1/25/2018

City: Fresno
Project #: CA18_2014_001

DAILY TOTALS	NB	SB	EB	WB	Total
	0	0	1,193	1,058	2,251

AM Period	NB	SB	EB		WB		TOTAL		PM Period	NB	SB	EB		WB		TOTAL	
00:00			2		1		3		12:00			22		11		33	
00:15			0		1		1		12:15			19		15		34	
00:30			0		0		0		12:30			18		14		32	
00:45			1	3	0	2	1	5	12:45			8	67	14	54	22	121
01:00			2		1		3		13:00			19		8		27	
01:15			0		0		0		13:15			17		11		28	
01:30			0		0		0		13:30			11		18		29	
01:45			0	2	1	2	1	4	13:45			18	65	12	49	30	114
02:00			1		1		2		14:00			11		15		26	
02:15			0		0		0		14:15			20		13		33	
02:30			0		0		0		14:30			20		10		30	
02:45			0	1	1	2	1	3	14:45			26	77	14	52	40	129
03:00			1		0		1		15:00			38		24		62	
03:15			0		1		1		15:15			32		53		85	
03:30			0		0		0		15:30			25		22		47	
03:45			1	2	1	2	2	4	15:45			33	128	17	116	50	244
04:00			1		1		2		16:00			42		12		54	
04:15			0		2		2		16:15			29		17		46	
04:30			0		3		3		16:30			49		14		63	
04:45			1	2	5	11	6	13	16:45			33	153	14	57	47	210
05:00			1		2		3		17:00			51		14		65	
05:15			1		4		5		17:15			43		14		57	
05:30			3		6		9		17:30			45		10		55	
05:45			1	6	10	22	11	28	17:45			22	161	12	50	34	211
06:00			3		10		13		18:00			17		8		25	
06:15			4		8		12		18:15			21		7		28	
06:30			8		11		19		18:30			18		11		29	
06:45			12	27	27	56	39	83	18:45			17	73	6	32	23	105
07:00			19		38		57		19:00			13		8		21	
07:15			22		43		65		19:15			5		8		13	
07:30			22		55		77		19:30			11		12		23	
07:45			36	99	56	192	92	291	19:45			5	34	3	31	8	65
08:00			31		45		76		20:00			5		7		12	
08:15			11		50		61		20:15			7		1		8	
08:30			18		20		38		20:30			7		4		11	
08:45			12	72	14	129	26	201	20:45			9	28	2	14	11	42
09:00			9		11		20		21:00			6		2		8	
09:15			11		15		26		21:15			3		2		5	
09:30			9		13		22		21:30			2		4		6	
09:45			8	37	15	54	23	91	21:45			1	12	1	9	2	21
10:00			14		10		24		22:00			3		2		5	
10:15			12		12		24		22:15			6		0		6	
10:30			11		12		23		22:30			3		7		10	
10:45			8	45	11	45	19	90	22:45			6	18	0	9	6	27
11:00			22		10		32		23:00			6		1		7	
11:15			19		14		33		23:15			0		0		0	
11:30			13		14		27		23:30			2		1		3	
11:45			18	72	27	65	45	137	23:45			1	9	1	3	2	12
TOTALS				368		582		**950**	**TOTALS**				825		476		**1301**
SPLIT %				38.7%		61.3%		**42.2%**	**SPLIT %**				63.4%		36.6%		**57.8%**

DAILY TOTALS	NB	SB	EB	WB	Total
	0	0	1,193	1,058	2,251

	NB	SB	EB	WB	TOTAL		NB	SB	EB	WB	TOTAL
AM Peak Hour			07:15	07:30	**07:15**	**PM Peak Hour**			16:30	15:00	**15:00**
AM Pk Volume			111	206	**310**	**PM Pk Volume**			176	116	**244**
Pk Hr Factor			0.771	0.920	**0.842**	**Pk Hr Factor**			0.863	0.547	**0.718**
7 - 9 Volume	0	0	171	321	**492**	**4 - 6 Volume**	0	0	314	107	**421**
7 - 9 Peak Hour			07:15	07:30	**07:15**	**4 - 6 Peak Hour**			16:30	16:15	**16:30**
7 - 9 Pk Volume	0	0	111	206	**310**	**4 - 6 Pk Volume**	0	0	176	59	**232**
Pk Hr Factor	0.000	0.000	0.771	0.920	**0.842**	**Pk Hr Factor**	0.000	0.000	0.863	0.868	**0.892**

Appendix C: Traffic Modeling

~~January 3~~March 19, 2018

Kai Han, TE
Council of Fresno County Governments
2035 Tulare Street, Suite 201
Fresno, CA 93721

Via E-mail Only: khan@fresnocog.org

Subject: ***Traffic Modeling Re-Run Request for the Preparation of a Traffic Impact Analysis for ~~Tract 6214 Located on the Northeast Quadrant of McKinley Avenue and Fowler Avenue~~ the Clovis Unified School District Fowler-McKinley Elementary School Project in the City of Fresno (JLB Project 004-~~054~~059)***

Dear Mr. Han,

JLB Traffic Engineering, Inc. (JLB) hereby requests a traffic modeling re-run for the Project described below. The Clovis Unified School District (District) Fowler-McKinley Elementary School (Project) is located on the northeast corner of the McKinley Avenue alignment and Fowler Avenue in the County of Fresno but includes annexation of the site to the City of Fresno. The Project proposes to build an Elementary School with approximately 28 classrooms, administrative offices, a multi-purpose building, hardcourt areas and athletic fields that could potentially be lighted. The Project is estimated to serve up to 750 students in Kindergarten through sixth grades. The timing for construction of the Project is dependent on enrollment growth and funding availability, but the District estimates that the school could be constructed in approximately five years. Tract 6214 ~~(Project)~~ proposes to build a ~~220~~210-unit single family subdivision on 31.87 acres on the northeast quadrant of Fowler Avenue and McKinley Avenue. Based on information provided to JLB, ~~the Project~~Tract 6214 will undergo a General Plan Amendment to modify the land use to allow a higher residential density. An aerial of the Project vicinity is shown in Exhibit A while the ~~Project~~ Tract 6214 site plan is shown in Exhibit B.

The purpose of this TIA is to evaluate the potential on- and off-site traffic impacts, identify short-term roadway and circulation needs, determine potential mitigation measures and identify any critical traffic issues that should be addressed in the on-going planning process.

Scenarios:

The following scenarios are requested:

1. Base Year 2018 (with Link and TAZ modifications)
2. Year 2018 plus Project Select Zone (with Link and TAZ modifications)
3. Cumulative Year 2035 plus Project Select Zone (with Link and TAZ modifications)
4. Differences between model runs 3 and 1 above

Changes and/or additions to the Model Network or TAZ's

JLB reviewed the Fresno COG model network for the Base Year 2018 and Cumulative Year 2035. Based on this review, JLB requests the following link and TAZ Network modifications. Details on the requested Link and TAZ modifications for Base Year 2018 and Cumulative Year 2035 are illustrated in Exhibit C.

LINK and TAZ MODIFICATIONS (For Base Year 2018 and Year 2018 plus Project Select Zone Scenarios):

1. Modify TAZ 1685 to eliminate TAZ Connector to Dakota Avenue (north)
2. Modify Armstrong Avenue as follows:
   a. Increase southbound lanes between Node 8378 and Shields Avenue to two lanes
   b. Increase northbound lanes between Node 12150 and Node 8378 to two lanes
3. Modify Temperance Avenue to increase northbound lanes between Node 8362 and Clinton Avenue to two lanes
4. Modify TAZ 1415 to eliminate TAZ Connector to Fowler Avenue

LINK and TAZ MODIFICATIONS (Year 2018 plus Project Select Zone Scenario Only):

1. Create McKinley Avenue between Fowler Avenue and a point approximately 1,320 feet to the east
   a. Classification: Collector
   b. One lane in each direction
   c. Speed 45 MPH

LINK and TAZ MODIFICATIONS (For Base Year 2018, Year 2018 plus Project Select Zone and Cumulative Year 2035 plus Project Select Zone Scenarios):

1. Modify TAZ 1056 to create TAZ Connector to Fowler Avenue (east)
2. Modify Fowler Avenue as follows:
   a. Increase southbound lanes between Dakota Avenue and Clinton Avenue to two lanes
   b. Increase northbound lanes between Clinton Avenue and Node 8380 to two lanes
3. Modify Shields Avenue to increase westbound lanes west of Locan Avenue to two lanes

LINK and TAZ MODIFICATIONS (For Year 2018 plus Project Select Zone and Cumulative Year 2035 plus Project Select Zone Scenarios):

1. Modify TAZ 1684 to eliminate TAZ Connector to Fowler Avenue
2. Create ~~Medellin~~ Kerry Avenue between Fowler Avenue and a point just west of Node 1684
   a. Classification: Connector
   b. One lane in each direction
   c. Speed 30 MPH
3. Create ~~Project~~ Tract 6214 TAZ B generally located southeast of the intersection of Clinton Avenue and Fowler Avenue (see Exhibits B and C). TAZ B shall have TAZ Connectors to Clinton Avenue (north) and Medellin Avenue (south).
4. Create ~~Project~~ Tract 6214 TAZ A generally located northeast of the intersection of McKinley Avenue and Fowler Avenue (see Exhibits B and C). TAZ A shall have TAZ Connectors to Medellin Avenue (north) and McKinley Avenue (south).

5. Create ~~Near Term~~ Project TAZ C generally located northeast of the intersection of McKinley Avenue and Fowler Avenue (see Exhibits B and C). TAZ C shall have TAZ Connectors to ~~Medellin~~ Kerry Avenue (north) and McKinley Avenue (south).

LINK and TAZ MODIFICATIONS (For Cumulative Year 2035 plus Project Select Zone Scenario Only):

1. Modify Fowler Avenue as follows:
   a. Increase northbound lanes between Node 8380 and Dakota Avenue to two lanes
   b. Increase lanes between Clinton Avenue and Node 8238 to two lanes in each direction
2. Modify Sunnyside Avenue to reduce lanes south of Clinton Avenue to one lane in each direction
3. Modify McKinley Avenue to reduce lanes southeast of Node 12414 and east of Fowler Avenue to one lane in each direction

TAZ A ~~Project~~ Tract 6214 Only Trip Generation (For Year 2018 plus Project Select Zone and Cumulative Year 2035 plus Project Select Zone Scenarios Only)

Table I presents the trip generation for the proposed TAZ A ~~Project~~ Tract 6214 pursuant to the 10th Edition of the Trip Generation Manual with trip generation rates for Single-Family Detached Housing. At build-out, the ~~Project~~ Tract 6214 is estimated to generate a maximum of ~~651~~ 680 daily trips, ~~51~~ 53 AM peak hour trips and ~~68~~ 71 PM peak hour trips.

Table I: TAZ A ~~Project~~ Tract 6214 Only Trip Generation

Land Use (ITE Code)	*Size*	*Unit*	*Daily*		*AM Peak Hour*						*PM Peak Hour*					
			Rate	*Total*	*Trip Rate*	*In %*	*Out %*	*In*	*Out*	*Total*	*Trip Rate*	*In %*	*Out %*	*In*	*Out*	*Total*
Single-Family Detached Housing (210)	~~69~~ 72	d.u.	9.44	~~651~~ 680	0.74	25	75	13	~~38~~ 40	~~51~~ 53	0.99	63	37	~~43~~ 45	~~25~~ 26	~~68~~ 71
Total Project Trips				**~~651~~ 680**				**13**	**~~38~~ 40**	**~~51~~ 53**				**~~43~~ 45**	**~~25~~ 26**	**~~68~~ 71**

Note: d.u. = Dwelling Units

TAZ B ~~Project~~ Tract 6214 Only Trip Generation (For Year 2018 plus Project Select Zone and Cumulative Year 2035 plus Project Select Zone Scenarios Only)

Table II presents the trip generation for the proposed TAZ B ~~Project~~ Tract 6214 pursuant to the 10th Edition of the Trip Generation Manual with trip generation rates for Single-Family Detached Housing. At build-out, the ~~Project~~ Tract 6214 is estimated to generate a maximum of ~~1,425~~1,303 daily trips, ~~112~~ 102 AM peak hour trips and ~~149~~ 137 PM peak hour trips.

Table II: TAZ B ~~Project~~ Tract 6214 Only Trip Generation

Land Use (ITE Code)	*Size*	*Unit*	*Daily*		*AM Peak Hour*						*PM Peak Hour*					
			Rate	*Total*	*Trip Rate*	*In %*	*Out %*	*In*	*Out*	*Total*	*Trip Rate*	*In %*	*Out %*	*In*	*Out*	*Total*
Single-Family Detached Housing (210)	~~151~~ 138	d.u.	9.44	~~1,425~~ 1,303	0.74	25	75	~~28~~ 26	~~84~~ 76	~~112~~ 102	0.99	63	37	~~94~~ 86	~~56~~ 51	~~150~~ 137
Total Project Trips				**~~1,425~~ 1,303**				**~~28~~ 26**	**~~84~~ 76**	**~~112~~ 102**				**~~94~~ 86**	**~~56~~ 51**	**~~150~~ 137**

Note: d.u. = Dwelling Units

Access to ~~the Project~~Tract 6214

Access to and from the ~~Project~~ Tract 6214 site will from a total of three (3) points. One proposed access point is located on the south side of Clinton Avenue at approximately 975 feet east of Fowler Avenue. Another proposed access point is located on the east side of Fowler Avenue at approximately 1,300 feet south of Clinton Avenue. The final proposed access point is located on the north side of McKinley Avenue at approximately 925 feet east of Fowler Avenue. Additional Project details are found in Exhibit B.

TAZ C ~~Near Term~~ Project Only Trip Generation (For Year 2018 plus Project Select Zone and Cumulative Year 2035 plus Project Select Zone Scenario Only)

Table III presents the trip generation for the proposed TAZ C ~~Near Term~~ Project pursuant to the 10th Edition of the Trip Generation Manual with trip generation rates for Elementary School. At build-out, the ~~Near Term~~ Project is estimated to generate a maximum of ~~1,323~~1,418 daily trips, ~~469~~ 503 AM peak hour trips and ~~238~~ 255 PM peak hour trips.

Table III: TAZ C ~~Near Term~~ Project Only Trip Generation

Land Use (ITE Code)	Size	Unit	Daily		AM Peak Hour						PM Peak Hour					
			Rate	Total	Trip Rate	In %	Out %	In	Out	Total	Trip Rate	In %	Out %	In	Out	Total
Elementary School (520)	~~700~~ 750	students	1.89	~~1,323~~ 1,418	0.67	54	46	~~253~~ 272	~~216~~ 231	~~469~~ 503	~~0.17~~ 0.34	~~48~~ 45	~~52~~ 55	~~57~~ 115	~~62~~ 140	~~119~~ 255
Total Project Trips				**~~1,323~~ 1,418**				**~~253~~ 272**	**~~216~~ 231**	**~~469~~ 503**				**~~57~~ 115**	**~~62~~ 140**	**~~119~~ 255**

Access to the Project

Access to and from the Project site is assumed to be from two (2) points. One proposed access point is assumed on the south side of Kerry Avenue, approximately 325 feet east of Fowler Avenue and is assumed to have full access. The other proposed access point is assumed to be on the north side of McKinley Avenue, approximately 325 feet east of Fowler Avenue and is also assumed to have full access.

Please invoice JLB Traffic Engineering, Inc. and reference JLB Project No. 004-~~054~~ 059 on the invoice. If you have any questions or require additional information, please do not hesitate to contact me by phone at (559) 570-8991 or by e-mail at smaciel@JLBtraffic.com.

Sincerely,

Susana Maciel

Susana Maciel, EIT
Engineer I/II

cc: Jose Benavides, JLB Traffic Engineering, Inc.
Lang Yu, Fresno Council of Governments

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~~Z:\01 Projects\004 Fresno\004-054 TT 6214 TIA\Model Request\L01032018 Model Request.docx~~

Exhibit A – Aerial

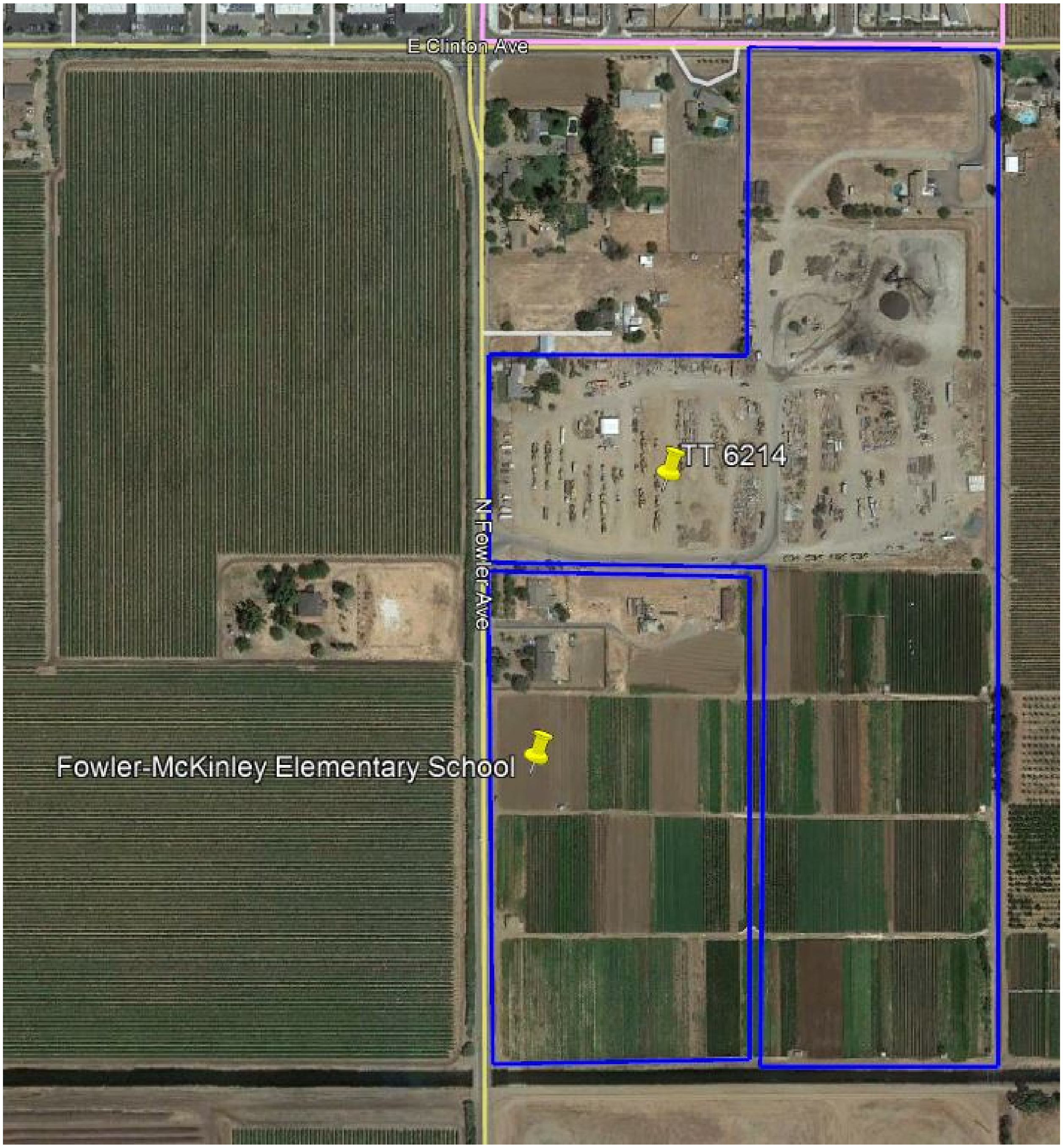
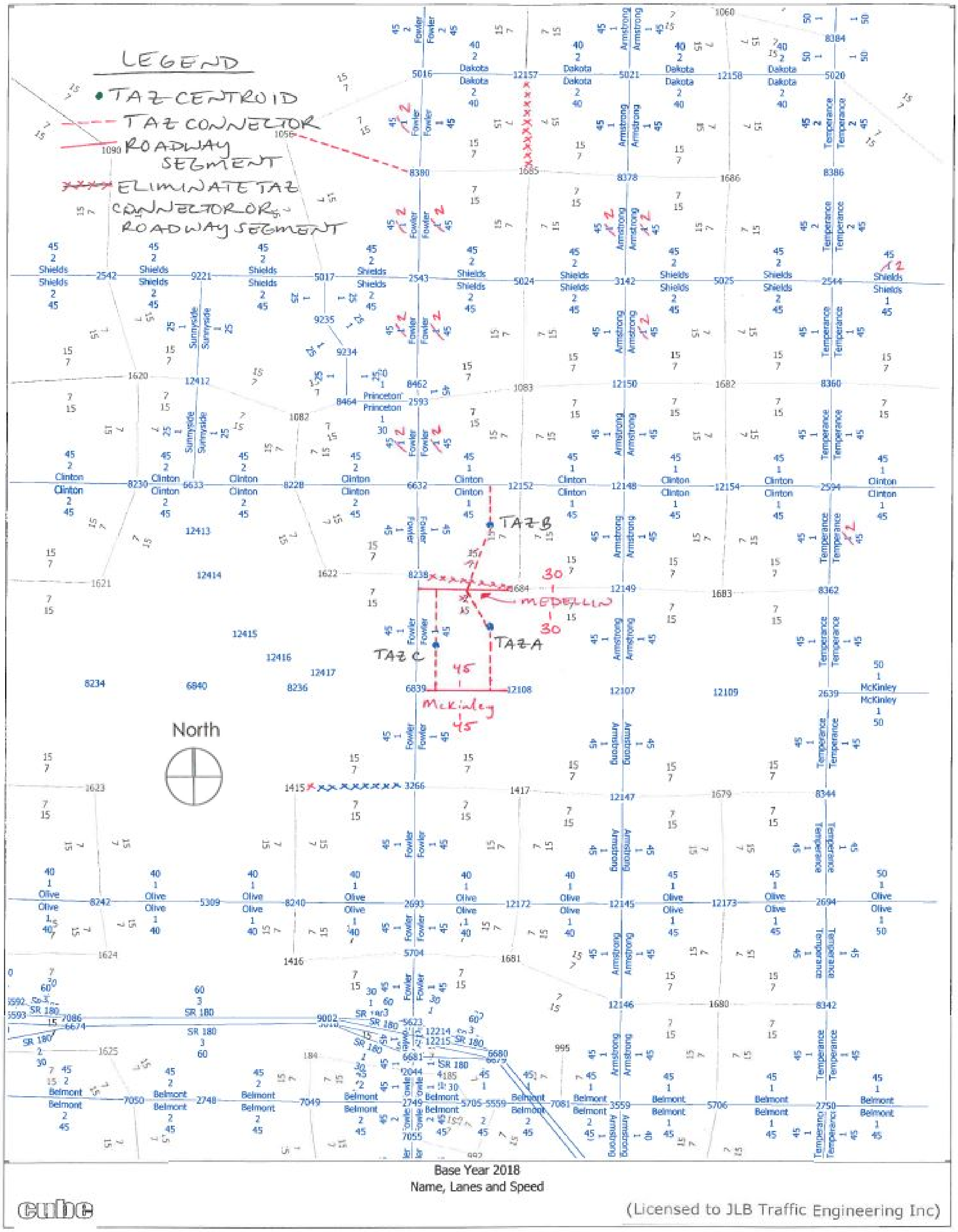
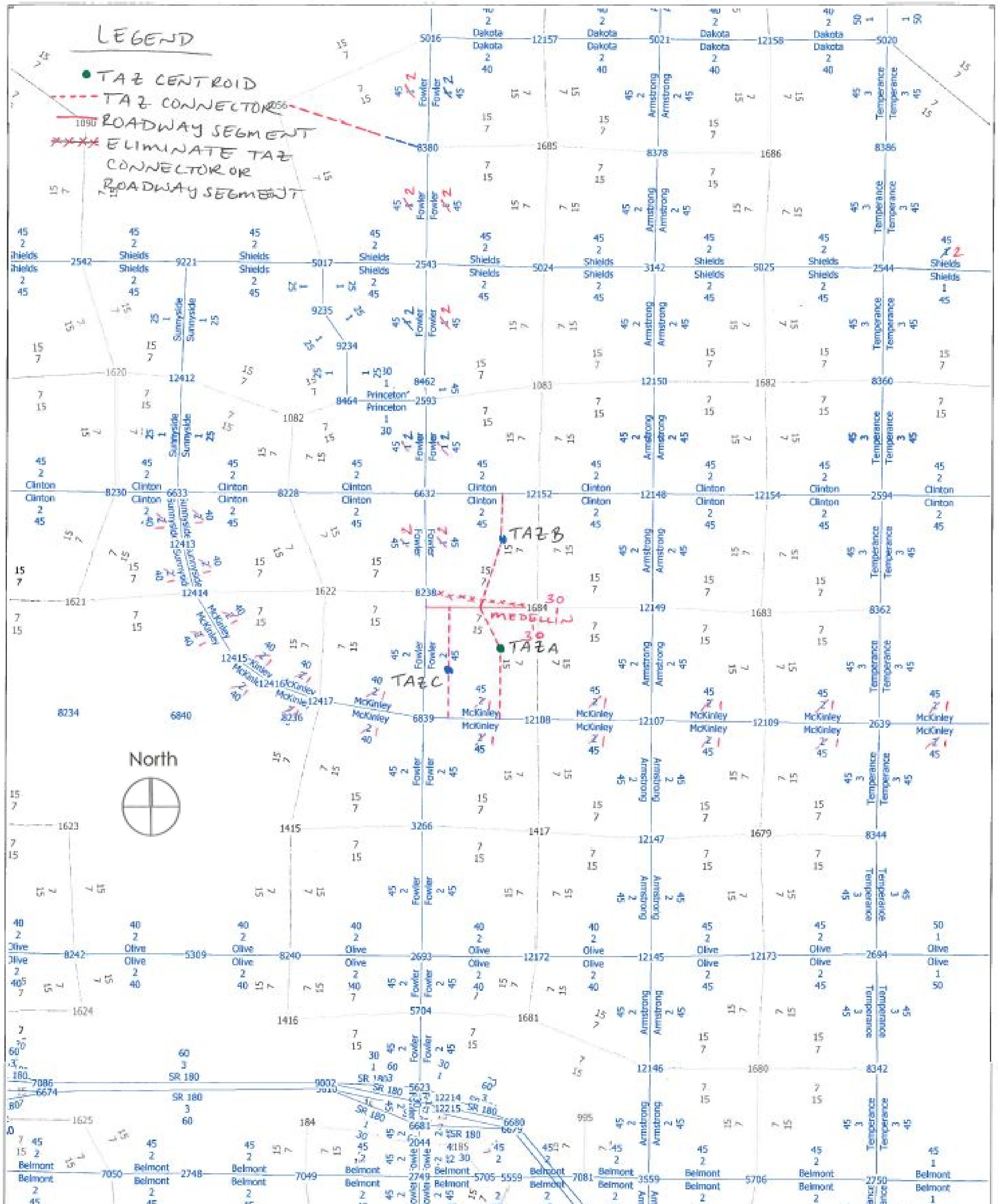


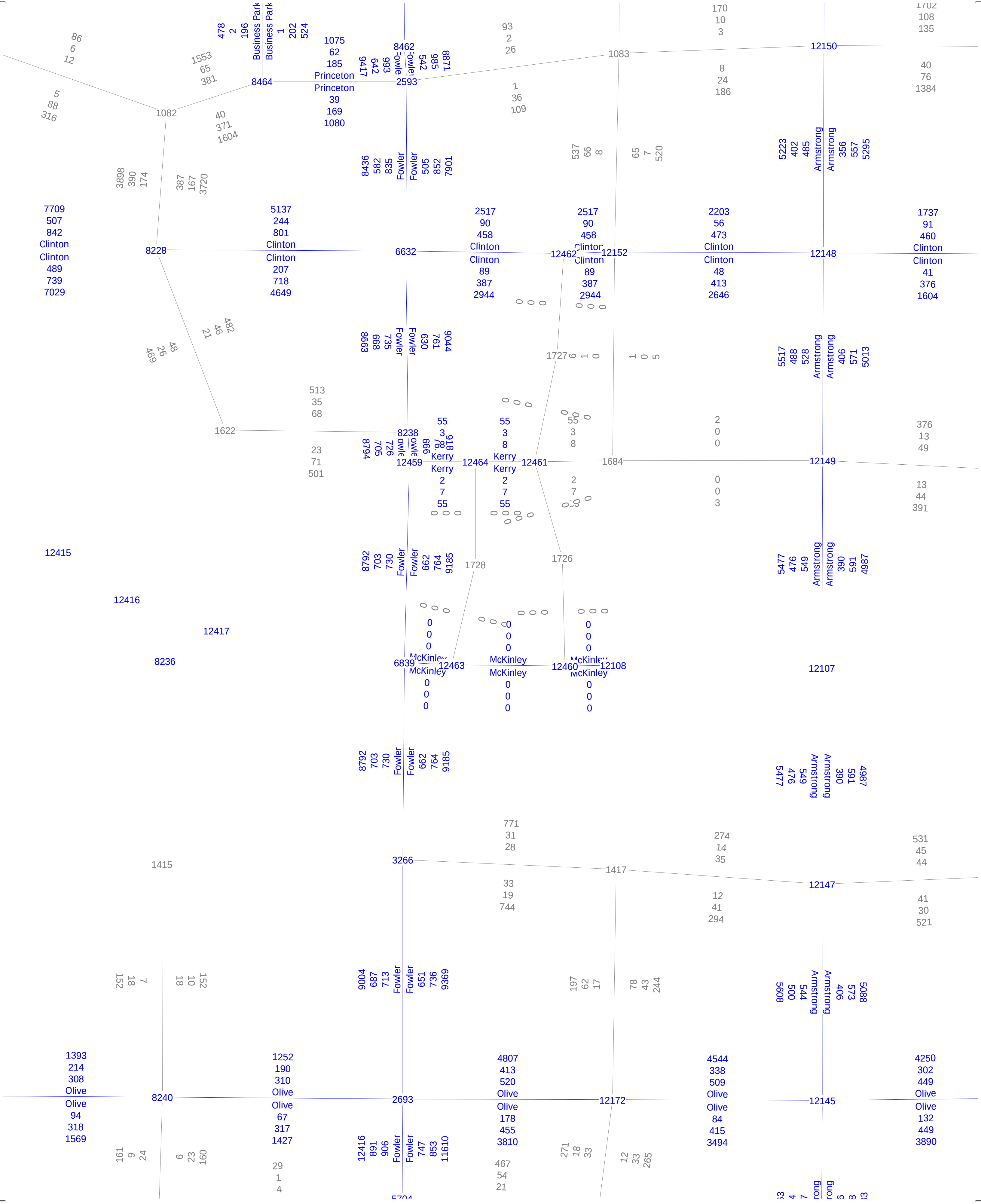
Exhibit B – Site Plan

Exhibit C – Model TAZ Modifications



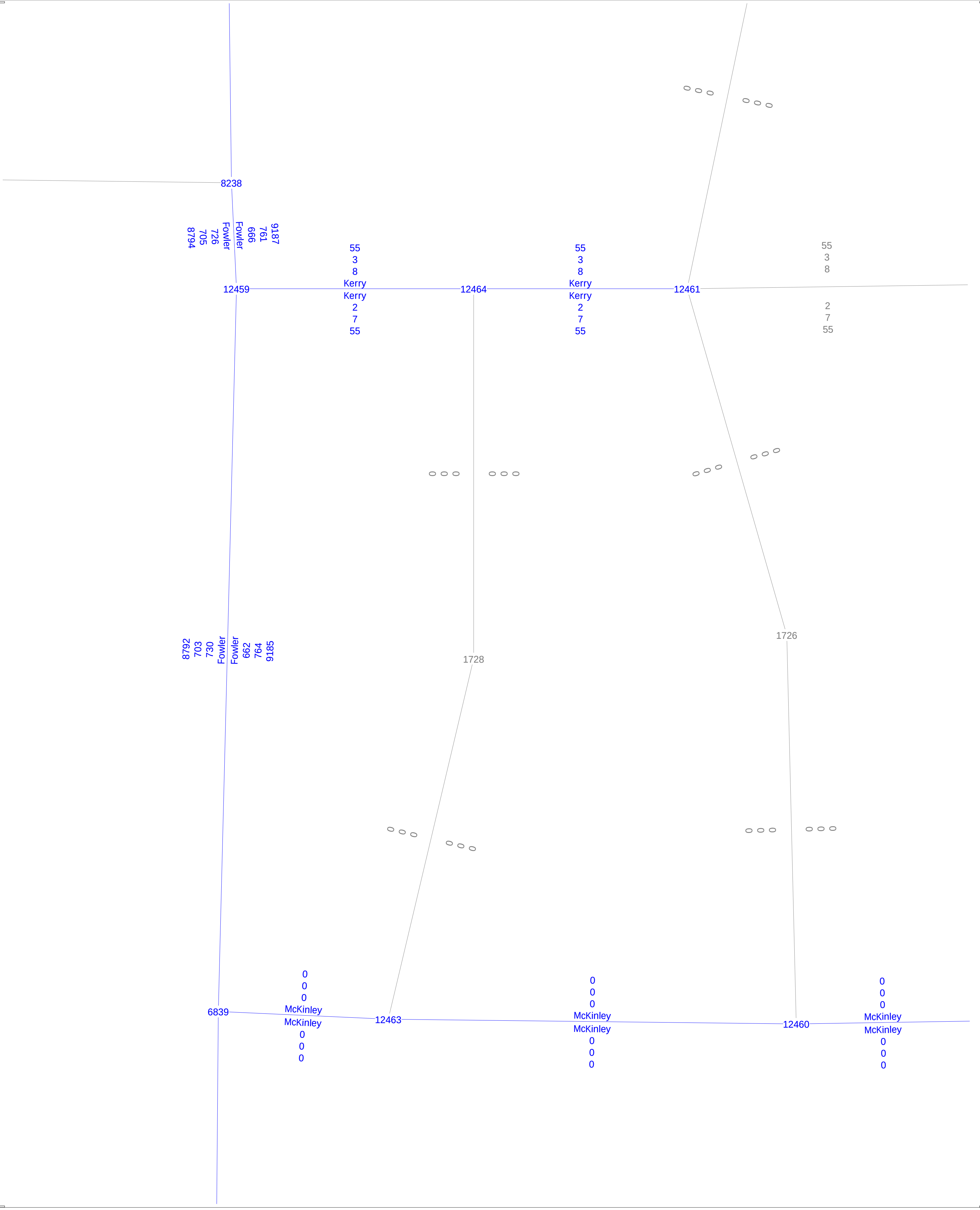


Cumulative Year 2035
Name, Lanes and Speed

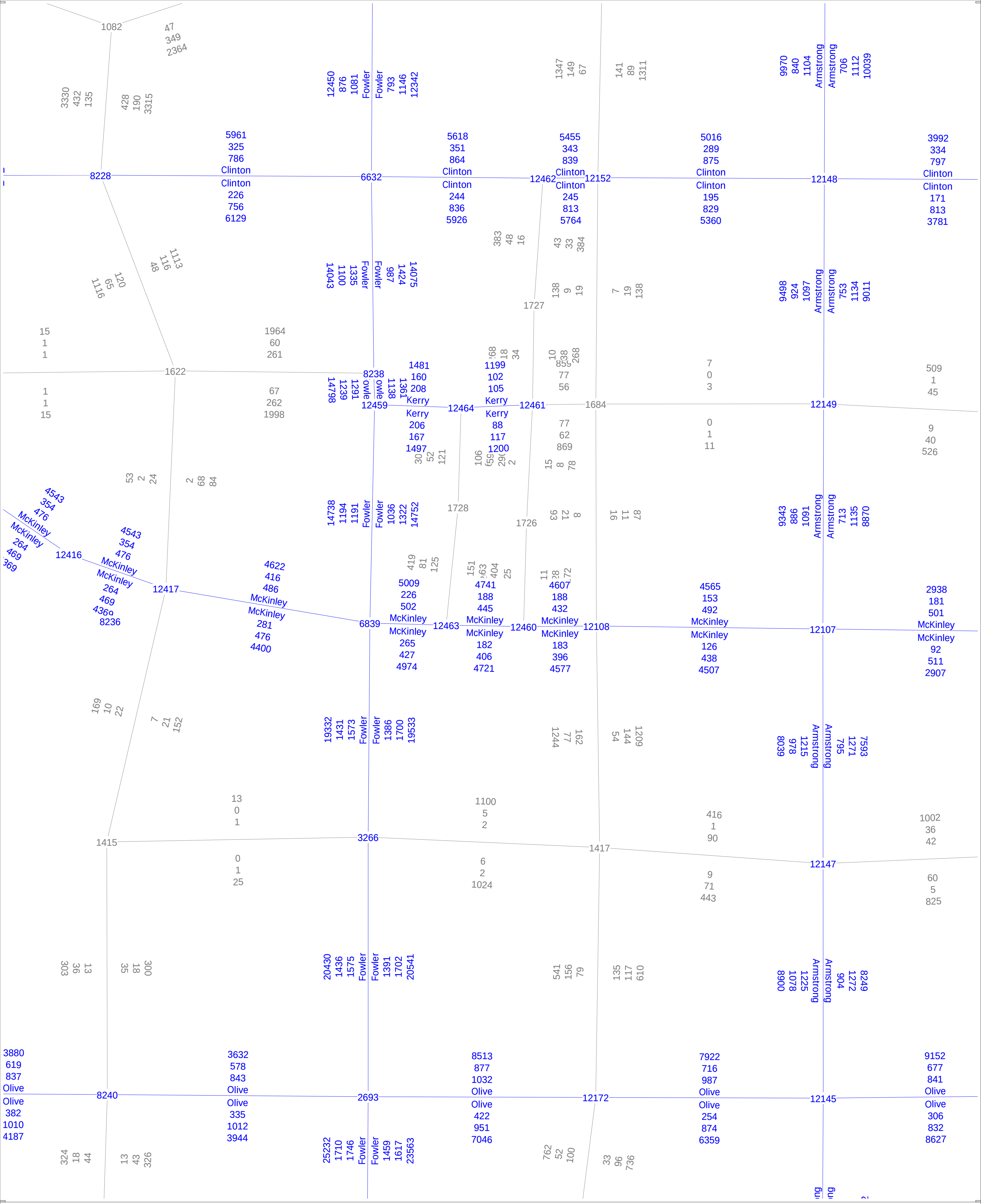


Base Year 2018

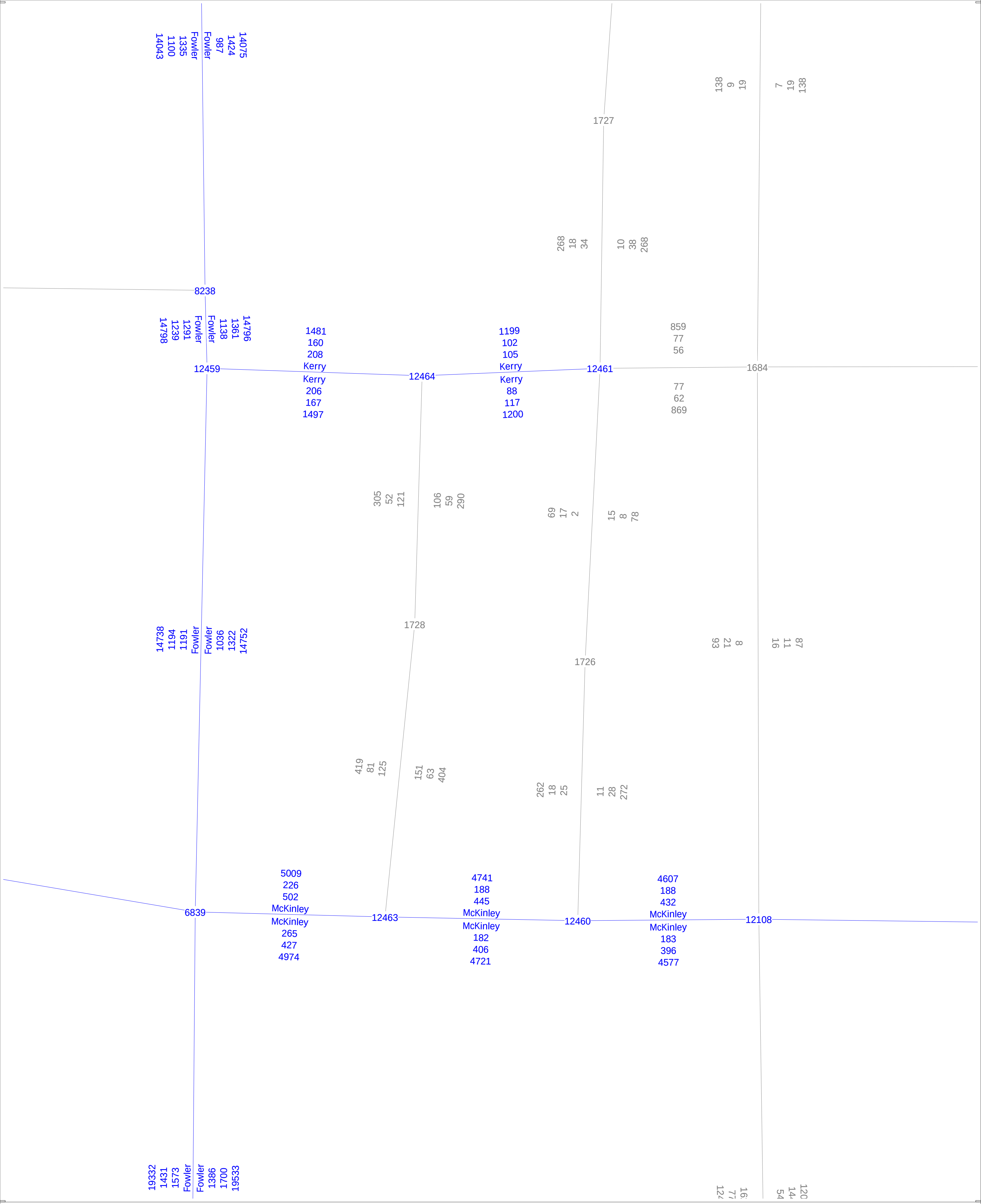
AM, PM and Daily Volumes



Base Year 2018
AM, PM and Daily Volumes



Cumulative Year 2035 plus Project
AM, PM and Daily Volumes



Cumulative Year 2035 plus Project
AM, PM and Daily Volumes

Appendix D: Methodology

Levels of Service Methodology

The description and procedures for calculating capacity and level of service (LOS) are found in the Transportation Research Board, Highway Capacity Manual (HCM). The HCM 2010 represents the research on capacity and quality of service for transportation facilities.

Quality of service requires quantitative measures to characterize operational conditions within a traffic stream. Level of service is a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience.

Six levels of service are defined for each type of facility that has analysis procedures available. Letters designate each level of service (LOS), from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each LOS represents a range of operating conditions and the driver's perception of these conditions. Safety is not included in the measures that establish a LOS.

Urban Streets (Automobile Mode)

The term "urban streets" refers to urban arterials and collectors, including those in downtown areas. Arterial streets are roads that primarily serve longer through trips. However, providing access to abutting commercial and residential land uses is also an important function of arterials. Collector streets provide both land access and traffic circulation within residential, commercial and industrial areas. Their access function is more important than that of arterials, and unlike arterials their operation is not always dominated by traffic signals. Downtown streets are signalized facilities that often resemble arterials. They not only move through traffic but also provide access to local businesses for passenger cars, transit buses, and trucks. Pedestrian conflicts and lane obstructions created by stopping or standing taxicabs, buses, trucks and parking vehicles that cause turbulence in the traffic flow are typical of downtown streets.

Flow Characteristics

The speed of vehicles on urban streets is influenced by three main factors, street environment, interaction among vehicles and traffic control.

The street environment includes the geometric characteristics of the facility, the character of roadside activity, and adjacent land uses. Thus, the environment reflects the number and width of lanes, type of median, driveway/access point density, spacing between signalized intersections, existence of parking, level of pedestrian and bicyclist activity and speed limit.

The interaction among vehicles is determined by traffic density, the proportion of trucks and buses, and turning movements. This interaction affects the operation of vehicles at intersections and, to a lesser extent, between signals.

Traffic controls (including signals and signs) forces a portion of all vehicles to slow or stop. The delays and speed changes caused by traffic control devices reduce vehicle speeds; however, such controls are needed to establish right-of-way.

Levels of Service (automobile Mode)

The average travel speed for through vehicles along an urban street is the determinant of the operating level of service (LOS). The travel speed along a segment, section or entire length of an urban street is dependent on the running speed between signalized intersections and the amount of control delay incurred at signalized intersections.

LOS A describes primarily free-flow operation. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Control delay at signalized intersections is minimal. Travel speeds exceed 85 of the base free flow speed (FFS).

LOS B describes reasonably unimpeded operation. The ability to maneuver within the traffic stream is only slightly restricted and control delay at the boundary intersections is not significant. The travel speed is between 67 and 85 percent of the base FFS.

LOS C describes stable operations. The ability to maneuver and change lanes in midblock location may be more restricted than at LOS B. Longer queues at the boundary intersections may contribute to lower travel speeds. The travel speed is between 50 and 67 percent of the base FFS.

LOS D indicates a less stable condition in which small increases in flow may cause substantial increases in delay and decreases in travel speed. This operation may be due to adverse signal progression, high volumes, inappropriate signal timing, at the boundary intersections. The travel speed is between 40 and 50 percent of the base FFS.

LOS E is characterized unstable operation and significant delay. Such operations may be due to some combination of adverse progression, high volume, and inappropriate signal timing at the boundary intersections. The travel speed is between 30 and 40 percent of the base FFS.

LOS F is characterized by street flow at extremely low speed. Congestion is likely occurring at the boundary intersections, as indicated by high delay and extensive queuing. The travel speed is 30 percent or less of the base FFS.

Table A-1: Urban Street Levels of Service (Automobile Mode)

Travel Speed as a Percentage of Base Free-Flow Speed (%)	LOS by Critical Volume-to-Capacity Ratio[a]	
	≤1.0	>1.0
>85	A	F
>67 to 85	B	F
>50 to 67	C	F
>40 to 50	D	F
>30 to 40	E	F
≤30	F	F

a = The Critical volume-to-capacity ratio is based on consideration of the through movement-to-capacity ratio at each boundary intersection in the subject direction of travel. The critical volume-to-capacity ratio is the largest ratio of those considered.
Source: Highway Capacity Manual 2010, Exhibit 16-4. Urban Street LOS Criteria (Automobile Mode)

Intersection Levels of Service

One of the more important elements limiting, and often interrupting the flow of traffic on a highway is the intersection. Flow on an interrupted facility is usually dominated by points of fixed operation such as traffic signals, stop and yield signs.

Signalized Intersections – Performance Measures

For signalized intersections the performance measures include automobile volume-to-capacity ratio, automobile delay, queue storage length, ratio of pedestrian delay, pedestrian circulation area, pedestrian perception score, bicycle delay, and bicycle perception score. LOS is also considered a performance measure. For the automobile mode average control delay per vehicle per approach is determined for the peak hour. A weighted average of control delay per vehicle is then determined for the intersection. A LOS designation is given to the weighted average control delay to better describe the level of operation. A description of LOS for signalized intersections is found in Table A-2.

Table A-2: Signalized Intersection Level of Service Description (Automobile Mode)

Level of Service	Description	Average Control Delay (seconds per vehicle)
A	Operations with a control delay of 10 seconds/vehicle or less and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when volume-to-capacity ratio is and either progression is exceptionally favorable or the cycle length is very short. If it's due to favorable progression, most vehicles arrive during the green indication and travel through the intersection without stopping.	≤10
B	Operations with control delay between 10.1 to 20.0 seconds/vehicle and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is low and either progression is highly favorable or the cycle length is short. More vehicles stop than with LOS A.	>10.0 to 20.0
C	Operations with average control delays between 20.1 to 35.0 seconds/vehicle and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio no greater than 1.0. This level is typically assigned when progression is favorable or the cycle length is moderate. Individual cycle failures (i.e., one or more queued vehicles are not able to depart as a result of insufficient capacity during the cycle) may begin to appear at this level. The number of vehicles stopping is significant, although many vehicles still pass through the intersection without stopping.	>20 to 35
D	Operations with control delay between 35.1 to 55.0 seconds/vehicle and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is high and either progression is ineffective or the cycle length is long. Many vehicles stop, and i ndividual cycle failures are noticeable.	>35 to 55
E	Operations with control delay between 55.1 to 80.0 seconds/vehicle and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is high, progression is unfavorable, and the cycle length is long. Individual cycle failures are frequent.	>55 to 80
F	Operations with unacceptable control delay exceeding 80.0 seconds/vehicle and a volume-to-capacity ratio greater than 1.0. This level is typically assigned when 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.	>80

Source: Highway Capacity Manual 2010

Unsignalized Intersections

The HCM 2010 procedures use control delay as a measure of effectiveness to determine level of service. Delay is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, traffic and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base conditions, i. e., in the absence of traffic control, geometric delay, any incidents, and any other vehicles. Control delay is the increased time of travel for a vehicle approaching and passing through an unsignalized intersection, compared with a free-flow vehicle if it were not required to slow or stop at the intersection.

All-Way Stop Controlled Intersections

All-way stop controlled intersections is a form of traffic controls in which all approaches to an intersection are required to stop. Similar to signalized intersections, at all-way stop controlled intersections the average control delay per vehicle per approach is determined for the peak hour. A weighted average of control delay per vehicle is then determined for the intersection as a whole. In other words the delay measured for all-way stop controlled intersections is a measure of the average delay for all vehicles passing through the intersection during the peak hour. A LOS designation is given to the weighted average control delay to better describe the level of operation.

Two-Way Stop Controlled Intersections

Two-way stop controlled (TWSC) intersections in which stop signs are used to assign the right-of-way, are the most prevalent type of intersection in the United States. At TWSC intersections the stop-controlled approaches are referred as the minor street approaches and can be either public streets or private driveways. The approaches that are not controlled by stop signs are referred to as the major street approaches.

The capacity of movements subject to delay are determined using the "critical gap" method of capacity analysis. Expected average control delay based on movement volume and movement capacity is calculated. A LOS for TWSC intersection is determined by the computed or measured control delay for each minor movement. LOS is not defined for the intersection as a whole for three main reasons: (a) major-street through vehicles are assumed to experience zero delay; (b) the disproportionate number of major-street through vehicles at the typical TWSC intersection skews the weighted average of all movements, resulting in a very low overall average delay from all vehicles; and (c) the resulting low delay can mask important LOS deficiencies for minor movements. Table A-3 provides a description of LOS at unsignalized intersections.

Table A-3: Unsignalized Intersection Level of Service Description (Automobile Mode)

Control Delay (seconds per vehicle)	**LOS by Volume-to-Capacity Ratio**	
	v/c ≤ 1.0	**v/c > 1.0**
≤10	A	F
>10 to 15	B	F
>15 to 25	C	F
>25 to 35	D	F
>35 to 50	E	F
>50	F	F

Source: HCM 2010 Exhibit 19-1.

Appendix E: Existing Traffic Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	69	35	32	169	39	72	295	23	18	394	210
Future Volume (veh/h)	38	69	35	32	169	39	72	295	23	18	394	210
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1845	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	40	73	37	34	178	41	76	311	24	19	415	221
Adj No. of Lanes	1	1	0	1	1	1	1	1	1	1	1	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	77	186	94	68	287	244	120	646	550	41	564	479
Arrive On Green	0.04	0.16	0.16	0.04	0.16	0.16	0.07	0.35	0.35	0.02	0.31	0.31
Sat Flow, veh/h	1757	1156	586	1757	1845	1568	1757	1845	1568	1757	1845	1568
Grp Volume(v), veh/h	40	0	110	34	178	41	76	311	24	19	415	221
Grp Sat Flow(s),veh/h/ln	1757	0	1741	1757	1845	1568	1757	1845	1568	1757	1845	1568
Q Serve(g_s), s	1.0	0.0	2.5	0.8	4.0	1.0	1.9	5.9	0.4	0.5	9.0	5.1
Cycle Q Clear(g_c), s	1.0	0.0	2.5	0.8	4.0	1.0	1.9	5.9	0.4	0.5	9.0	5.1
Prop In Lane	1.00		0.34	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	77	0	280	68	287	244	120	646	550	41	564	479
V/C Ratio(X)	0.52	0.00	0.39	0.50	0.62	0.17	0.63	0.48	0.04	0.46	0.74	0.46
Avail Cap(c_a), veh/h	197	0	1290	237	1408	1196	264	1118	950	197	1047	890
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	0.00	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	20.8	0.0	16.7	21.0	17.6	16.3	20.2	11.3	9.5	21.5	13.9	12.5
Incr Delay (d2), s/veh	5.3	0.0	0.9	5.6	2.2	0.3	5.4	0.6	0.0	7.8	1.9	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	0.6	0.0	1.3	0.5	2.2	0.5	1.1	3.0	0.2	0.3	4.8	2.2
LnGrp Delay(d),s/veh	26.2	0.0	17.6	26.7	19.7	16.6	25.6	11.9	9.6	29.2	15.8	13.2
LnGrp LOS	C		B	C	B	B	C	B	A	C	B	B
Approach Vol, veh/h		150			253			411			655	
Approach Delay, s/veh		19.9			20.2			14.3			15.3	
Approach LOS		B			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.2	20.9	5.9	12.5	7.2	18.9	6.2	12.2
Change Period (Y+Rc), s	* 4.2	5.3	* 4.2	5.3	* 4.2	5.3	* 4.2	5.3
Max Green Setting (Gmax), s	* 5	27.0	* 6	33.0	* 6.7	25.3	* 5	34.0
Max Q Clear Time (g_c+I1), s	2.5	7.9	2.8	4.5	3.9	11.0	3.0	6.0
Green Ext Time (p_c), s	0.0	1.6	0.0	0.5	0.0	2.6	0.0	1.0

Intersection Summary	
HCM 2010 Ctrl Delay	16.3
HCM 2010 LOS	B

Notes

Intersection	
Intersection Delay, s/veh	12.5
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	2	367	15	15	440
Future Vol, veh/h	13	2	367	15	15	440
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	14	2	382	16	16	458
Number of Lanes	1	0	1	0	0	1
Approach	WB		NB		SB	
Opposing Approach			SB		NB	
Opposing Lanes	0		1		1	
Conflicting Approach Left	NB				WB	
Conflicting Lanes Left	1		0		1	
Conflicting Approach Right	SB		WB			
Conflicting Lanes Right	1		1		0	
HCM Control Delay	9.1		11.7		13.3	
HCM LOS	A		B		B	

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	87%	3%
Vol Thru, %	96%	0%	97%
Vol Right, %	4%	13%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	382	15	455
LT Vol	0	13	15
Through Vol	367	0	440
RT Vol	15	2	0
Lane Flow Rate	398	16	474
Geometry Grp	1	1	1
Degree of Util (X)	0.492	0.026	0.58
Departure Headway (Hd)	4.45	5.894	4.406
Convergence, Y/N	Yes	Yes	Yes
Cap	812	606	820
Service Time	2.468	3.945	2.424
HCM Lane V/C Ratio	0.49	0.026	0.578
HCM Control Delay	11.7	9.1	13.3
HCM Lane LOS	B	A	B
HCM 95th-tile Q	2.8	0.1	3.8

Intersection	
Intersection Delay, s/veh	68.5
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	38	23	461	110	0	15	346	82	3	441	5
Future Vol, veh/h	17	38	23	461	110	0	15	346	82	3	441	5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	18	39	24	475	113	0	15	357	85	3	455	5
Number of Lanes	1	1	0	1	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	2
HCM Control Delay	14.2	93.8	54.7	59.4
HCM LOS	B	F	F	F

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1
Vol Left, %	3%	100%	0%	100%	0%	1%
Vol Thru, %	78%	0%	62%	0%	100%	98%
Vol Right, %	19%	0%	38%	0%	0%	1%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	443	17	61	461	110	449
LT Vol	15	17	0	461	0	3
Through Vol	346	0	38	0	110	441
RT Vol	82	0	23	0	0	5
Lane Flow Rate	457	18	63	475	113	463
Geometry Grp	2	7	7	7	7	2
Degree of Util (X)	0.933	0.049	0.161	1.13	0.253	0.954
Departure Headway (Hd)	7.764	10.505	9.699	8.557	8.038	7.831
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	470	343	372	423	447	468
Service Time	5.764	8.205	7.399	6.317	5.797	5.831
HCM Lane V/C Ratio	0.972	0.052	0.169	1.123	0.253	0.989
HCM Control Delay	54.7	13.7	14.3	112.9	13.5	59.4
HCM Lane LOS	F	B	B	F	B	F
HCM 95th-tile Q	10.9	0.2	0.6	17.1	1	11.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	113	171	69	13	49	15	25	428	22	37	358	57
Future Volume (veh/h)	113	171	69	13	49	15	25	428	22	37	358	57
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1845	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	120	182	73	14	52	16	27	455	23	39	381	61
Adj No. of Lanes	1	1	0	1	1	1	1	1	1	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	153	261	104	31	255	217	56	581	494	75	601	511
Arrive On Green	0.09	0.21	0.21	0.02	0.14	0.14	0.03	0.31	0.31	0.04	0.33	0.33
Sat Flow, veh/h	1757	1253	503	1757	1845	1568	1757	1845	1568	1757	1845	1568
Grp Volume(v), veh/h	120	0	255	14	52	16	27	455	23	39	381	61
Grp Sat Flow(s),veh/h/ln	1757	0	1756	1757	1845	1568	1757	1845	1568	1757	1845	1568
Q Serve(g_s), s	3.1	0.0	6.1	0.4	1.1	0.4	0.7	10.2	0.5	1.0	8.0	1.2
Cycle Q Clear(g_c), s	3.1	0.0	6.1	0.4	1.1	0.4	0.7	10.2	0.5	1.0	8.0	1.2
Prop In Lane	1.00		0.29	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	153	0	365	31	255	217	56	581	494	75	601	511
V/C Ratio(X)	0.78	0.00	0.70	0.45	0.20	0.07	0.48	0.78	0.05	0.52	0.63	0.12
Avail Cap(c_a), veh/h	266	0	1383	193	1376	1169	193	1015	863	193	1015	863
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	0.00	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	20.4	0.0	16.7	22.2	17.4	17.1	21.7	14.2	10.9	21.4	13.1	10.8
Incr Delay (d2), s/veh	8.4	0.0	2.4	9.7	0.4	0.1	6.4	2.4	0.0	5.5	1.1	0.1
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	1.8	0.0	3.2	0.3	0.6	0.2	0.4	5.6	0.2	0.6	4.2	0.6
LnGrp Delay(d),s/veh	28.8	0.0	19.2	31.8	17.8	17.2	28.1	16.6	10.9	26.8	14.2	10.9
LnGrp LOS	C		B	C	B	B	C	B	B	C	B	B
Approach Vol, veh/h		375			82			505			481	
Approach Delay, s/veh		22.2			20.1			16.9			14.8	
Approach LOS		C			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.1	19.7	5.0	14.8	5.6	20.2	8.2	11.6
Change Period (Y+Rc), s	* 4.2	5.3	* 4.2	5.3	* 4.2	5.3	* 4.2	5.3
Max Green Setting (Gmax), s	* 5	25.1	* 5	35.9	* 5	25.1	* 6.9	34.0
Max Q Clear Time (g_c+I1), s	3.0	12.2	2.4	8.1	2.7	10.0	5.1	3.1
Green Ext Time (p_c), s	0.0	2.1	0.0	1.4	0.0	2.0	0.0	0.2

Intersection Summary	
HCM 2010 Ctrl Delay	17.8
HCM 2010 LOS	B

Notes

Intersection	
Intersection Delay, s/veh	15.3
Intersection LOS	C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	9	10	461	8	3	498
Future Vol, veh/h	9	10	461	8	3	498
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	9	11	485	8	3	524
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	9.2	14.8	16
HCM LOS	A	B	C

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	47%	1%
Vol Thru, %	98%	0%	99%
Vol Right, %	2%	53%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	469	19	501
LT Vol	0	9	3
Through Vol	461	0	498
RT Vol	8	10	0
Lane Flow Rate	494	20	527
Geometry Grp	1	1	1
Degree of Util (X)	0.622	0.033	0.662
Departure Headway (Hd)	4.539	5.881	4.518
Convergence, Y/N	Yes	Yes	Yes
Cap	795	605	802
Service Time	2.566	3.953	2.544
HCM Lane V/C Ratio	0.621	0.033	0.657
HCM Control Delay	14.8	9.2	16
HCM Lane LOS	B	A	C
HCM 95th-tile Q	4.4	0.1	5.1

Intersection	
Intersection Delay, s/veh	82.4
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	24	62	31	201	47	7	6	435	157	3	470	13
Future Vol, veh/h	24	62	31	201	47	7	6	435	157	3	470	13
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	26	68	34	221	52	8	7	478	173	3	516	14
Number of Lanes	1	1	0	1	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	2
HCM Control Delay	14.4	19.9	134.5	67.4
HCM LOS	B	C	F	F

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1
Vol Left, %	1%	100%	0%	100%	0%	1%
Vol Thru, %	73%	0%	67%	0%	87%	97%
Vol Right, %	26%	0%	33%	0%	13%	3%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	598	24	93	201	54	486
LT Vol	6	24	0	201	0	3
Through Vol	435	0	62	0	47	470
RT Vol	157	0	31	0	7	13
Lane Flow Rate	657	26	102	221	59	534
Geometry Grp	2	7	7	7	7	2
Degree of Util (X)	1.212	0.069	0.246	0.538	0.135	1
Departure Headway (Hd)	6.641	9.778	9.045	9.084	8.493	7.265
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	545	368	400	400	425	502
Service Time	4.711	7.478	6.745	6.784	6.193	5.265
HCM Lane V/C Ratio	1.206	0.071	0.255	0.552	0.139	1.064
HCM Control Delay	134.5	13.2	14.7	21.9	12.5	67.4
HCM Lane LOS	F	B	B	C	B	F
HCM 95th-tile Q	24.3	0.2	1	3.1	0.5	13.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	38	23	461	110	0	15	346	82	3	441	5
Future Volume (veh/h)	17	38	23	461	110	0	15	346	82	3	441	5
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	18	39	24	475	113	0	15	357	85	3	455	5
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	38	85	52	535	668	0	32	440	105	7	530	6
Arrive On Green	0.02	0.08	0.08	0.30	0.36	0.00	0.02	0.31	0.31	0.00	0.29	0.29
Sat Flow, veh/h	1757	1070	658	1757	1845	0	1757	1441	343	1757	1821	20
Grp Volume(v), veh/h	18	0	63	475	113	0	15	0	442	3	0	460
Grp Sat Flow(s),veh/h/ln	1757	0	1728	1757	1845	0	1757	0	1784	1757	0	1841
Q Serve(g_s), s	0.6	0.0	2.1	15.6	2.5	0.0	0.5	0.0	13.9	0.1	0.0	14.3
Cycle Q Clear(g_c), s	0.6	0.0	2.1	15.6	2.5	0.0	0.5	0.0	13.9	0.1	0.0	14.3
Prop In Lane	1.00		0.38	1.00		0.00	1.00		0.19	1.00		0.01
Lane Grp Cap(c), veh/h	38	0	137	535	668	0	32	0	545	7	0	536
V/C Ratio(X)	0.48	0.00	0.46	0.89	0.17	0.00	0.46	0.00	0.81	0.42	0.00	0.86
Avail Cap(c_a), veh/h	145	0	569	689	1179	0	145	0	664	145	0	685
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	0.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	29.4	0.0	26.7	20.1	13.1	0.0	29.5	0.0	19.5	30.2	0.0	20.3
Incr Delay (d2), s/veh	9.0	0.0	2.4	11.1	0.1	0.0	10.0	0.0	6.3	34.8	0.0	8.6
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	0.4	0.0	1.1	9.2	1.3	0.0	0.3	0.0	7.7	0.1	0.0	8.6
LnGrp Delay(d),s/veh	38.3	0.0	29.1	31.3	13.3	0.0	39.5	0.0	25.7	65.0	0.0	29.0
LnGrp LOS	D		C	C	B		D		C	E		C
Approach Vol, veh/h		81			588			457			463	
Approach Delay, s/veh		31.2			27.8			26.2			29.2	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.4	23.9	22.7	9.7	5.3	23.0	5.5	26.9
Change Period (Y+Rc), s	* 4.2	5.3	* 4.2	4.9	* 4.2	5.3	* 4.2	4.9
Max Green Setting (Gmax), s	* 5	22.6	* 24	20.0	* 5	22.6	* 5	38.8
Max Q Clear Time (g_c+I1), s	2.1	15.9	17.6	4.1	2.5	16.3	2.6	4.5
Green Ext Time (p_c), s	0.0	1.4	0.9	0.2	0.0	1.4	0.0	0.6

Intersection Summary	
HCM 2010 Ctrl Delay	27.9
HCM 2010 LOS	C

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	62	31	201	47	7	6	435	157	3	470	13
Future Volume (veh/h)	24	62	31	201	47	7	6	435	157	3	470	13
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	26	68	34	221	52	8	7	478	173	3	516	14
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	52	107	54	273	340	52	16	552	200	7	754	20
Arrive On Green	0.03	0.09	0.09	0.16	0.22	0.22	0.01	0.43	0.43	0.00	0.42	0.42
Sat Flow, veh/h	1757	1161	581	1757	1562	240	1757	1294	468	1757	1788	49
Grp Volume(v), veh/h	26	0	102	221	0	60	7	0	651	3	0	530
Grp Sat Flow(s),veh/h/ln	1757	0	1742	1757	0	1802	1757	0	1762	1757	0	1836
Q Serve(g_s), s	0.8	0.0	3.3	7.0	0.0	1.6	0.2	0.0	19.4	0.1	0.0	13.6
Cycle Q Clear(g_c), s	0.8	0.0	3.3	7.0	0.0	1.6	0.2	0.0	19.4	0.1	0.0	13.6
Prop In Lane	1.00		0.33	1.00		0.13	1.00		0.27	1.00		0.03
Lane Grp Cap(c), veh/h	52	0	161	273	0	393	16	0	752	7	0	774
V/C Ratio(X)	0.50	0.00	0.63	0.81	0.00	0.15	0.43	0.00	0.87	0.42	0.00	0.68
Avail Cap(c_a), veh/h	170	0	602	389	0	847	152	0	1023	152	0	1066
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	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.7	0.0	25.3	23.6	0.0	18.3	28.5	0.0	15.1	28.7	0.0	13.6
Incr Delay (d2), s/veh	7.3	0.0	4.1	8.3	0.0	0.2	17.2	0.0	6.0	34.7	0.0	1.1
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	0.0	1.7	4.0	0.0	0.8	0.2	0.0	10.7	0.1	0.0	7.0
LnGrp Delay(d),s/veh	35.0	0.0	29.4	31.9	0.0	18.5	45.8	0.0	21.1	63.5	0.0	14.7
LnGrp LOS	C		C	C		B	D		C	E		B
Approach Vol, veh/h		128			281			658			533	
Approach Delay, s/veh		30.5			29.1			21.3			15.0	
Approach LOS		C			C			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.4	30.0	13.2	10.2	4.7	29.7	5.9	17.5
Change Period (Y+Rc), s	* 4.2	5.3	* 4.2	4.9	* 4.2	5.3	* 4.2	4.9
Max Green Setting (Gmax), s	* 5	33.6	* 13	20.0	* 5	33.6	* 5.6	27.2
Max Q Clear Time (g_c+I1), s	2.1	21.4	9.0	5.3	2.2	15.6	2.8	3.6
Green Ext Time (p_c), s	0.0	3.3	0.2	0.3	0.0	2.9	0.0	0.2

Intersection Summary	
HCM 2010 Ctrl Delay	21.3
HCM 2010 LOS	C

Notes

Intersection: 1: Fowler Avenue & Clinton Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	92	86	74	133	54	97	246	100	46	279	100
Average Queue (ft)	30	36	29	69	18	50	85	12	15	110	45
95th Queue (ft)	73	71	67	116	43	87	159	55	37	224	83
Link Distance (ft)		2643		1265			1238			2590	2590
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	150		225		105	175		40	255		
Storage Blk Time (%)				1			19	0		1	
Queuing Penalty (veh)				1			18	1		0	

Intersection: 4: Fowler Avenue & Floradora Avenue

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	31	130	168
Average Queue (ft)	14	75	89
95th Queue (ft)	36	111	141
Link Distance (ft)	1268	1286	1366
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Fowler Avenue & Olive Avenue

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	53	94	300	403	74	324	31	306
Average Queue (ft)	15	33	181	71	15	136	2	160
95th Queue (ft)	42	69	276	214	48	244	13	277
Link Distance (ft)		2658		2582		2548		1286
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	185		200		250		250	
Storage Blk Time (%)			6			2		4
Queuing Penalty (veh)			6			0		0

Zone Summary

Zone wide Queuing Penalty: 26

Intersection: 1: Fowler Avenue & Clinton Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	112	222	51	54	30	53	324	100	49	200	23
Average Queue (ft)	60	73	10	25	12	17	136	21	21	79	12
95th Queue (ft)	100	145	32	55	33	44	259	75	42	149	27
Link Distance (ft)		2641		1266			1238			2626	2626
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	150		225		105	175		40	255		
Storage Blk Time (%)		1					26	1			
Queuing Penalty (veh)		1					12	2			

Intersection: 4: Fowler Avenue & Floradora Avenue

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	27	164	281
Average Queue (ft)	9	82	91
95th Queue (ft)	28	122	167
Link Distance (ft)	1274	1287	1366
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Fowler Avenue & Olive Avenue

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	52	135	265	54	31	409	26	302
Average Queue (ft)	18	57	102	19	7	181	1	118
95th Queue (ft)	48	104	175	54	29	340	9	204
Link Distance (ft)		2658		2582		2548		1287
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	185		200		250		250	
Storage Blk Time (%)			1			3		1
Queuing Penalty (veh)			1			0		0

Zone Summary

Zone wide Queuing Penalty: 17

Appendix F: Existing plus Project Traffic Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	38	69	35	54	169	39	14	95	399	46	18	595
Future Volume (vph)	38	69	35	54	169	39	14	95	399	46	18	595
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.95		1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1752	1751		1752	1845	1568		1752	1845	1568	1752	1845
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1752	1751		1752	1845	1568		1752	1845	1568	1752	1845
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	44	80	41	63	197	45	16	110	464	53	21	692
RTOR Reduction (vph)	0	23	0	0	0	36	0	0	0	25	0	0
Lane Group Flow (vph)	44	98	0	63	197	9	0	126	464	28	21	692
Turn Type	Prot	NA		Prot	NA	Perm	Prot	Prot	NA	Perm	Prot	NA
Protected Phases	7	4		3	8		5	5	2		1	6
Permitted Phases						8				2		
Actuated Green, G (s)	2.8	15.9		3.9	17.0	17.0		9.8	43.9	43.9	1.8	35.9
Effective Green, g (s)	2.8	15.9		3.9	17.0	17.0		9.8	43.9	43.9	1.8	35.9
Actuated g/C Ratio	0.03	0.19		0.05	0.20	0.20		0.12	0.52	0.52	0.02	0.42
Clearance Time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	58	329		80	371	315		203	958	814	37	783
v/s Ratio Prot	0.03	0.06		c0.04	c0.11			c0.07	0.25		0.01	c0.38
v/s Ratio Perm						0.01				0.02		
v/c Ratio	0.76	0.30		0.79	0.53	0.03		0.62	0.48	0.03	0.57	0.88
Uniform Delay, d1	40.5	29.5		39.9	30.2	27.1		35.6	13.0	9.9	41.0	22.4
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	42.7	0.5		38.7	1.5	0.0		5.8	0.4	0.0	18.4	11.6
Delay (s)	83.2	30.0		78.6	31.6	27.2		41.4	13.4	9.9	59.4	33.9
Level of Service	F	C		E	C	C		D	B	A	E	C
Approach Delay (s)		44.2			40.7				18.6			29.7
Approach LOS		D			D				B			C

Intersection Summary			
HCM 2000 Control Delay	29.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	84.5	Sum of lost time (s)	19.0
Intersection Capacity Utilization	66.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	210
Future Volume (vph)	210
Ideal Flow (vphpl)	1900
Total Lost time (s)	5.3
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1568
Flt Permitted	1.00
Satd. Flow (perm)	1568
Peak-hour factor, PHF	0.86
Adj. Flow (vph)	244
RTOR Reduction (vph)	124
Lane Group Flow (vph)	120
Turn Type	Perm
Protected Phases	
Permitted Phases	6
Actuated Green, G (s)	35.9
Effective Green, g (s)	35.9
Actuated g/C Ratio	0.42
Clearance Time (s)	5.3
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	666
v/s Ratio Prot	
v/s Ratio Perm	0.08
v/c Ratio	0.18
Uniform Delay, d1	15.1
Progression Factor	1.00
Incremental Delay, d2	0.1
Delay (s)	15.3
Level of Service	B
Approach Delay (s)	
Approach LOS	

Intersection Summary

Intersection	
Int Delay, s/veh	2.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	125	412	22	125	572
Future Vol, veh/h	0	125	412	22	125	572
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	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	0	145	479	26	145	665

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	492	0	0	505	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.23	-	-	4.13	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.327	-	-	2.227	-
Pot Cap-1 Maneuver	0	575	-	-	1055	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	575	-	-	1055	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.4	0	1.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	575	1055	-
HCM Lane V/C Ratio	-	-	0.253	0.138	-
HCM Control Delay (s)	-	-	13.4	9	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	1	0.5	-

Intersection	
Int Delay, s/veh	4.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	67	39	391	24	101	469
Future Vol, veh/h	67	39	391	24	101	469
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	250	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	78	45	455	28	117	545

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1248	469	0	0	483	0
Stage 1	469	-	-	-	-	-
Stage 2	779	-	-	-	-	-
Critical Hdwy	6.43	6.23	-	-	4.13	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	-	-	2.227	-
Pot Cap-1 Maneuver	190	592	-	-	1074	-
Stage 1	628	-	-	-	-	-
Stage 2	451	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	160	592	-	-	1074	-
Mov Cap-2 Maneuver	160	-	-	-	-	-
Stage 1	530	-	-	-	-	-
Stage 2	451	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	34.1	0	1.6
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	160	592	1074	-
HCM Lane V/C Ratio	-	-	0.487	0.077	0.109	-
HCM Control Delay (s)	-	-	47.2	11.6	8.8	0
HCM Lane LOS	-	-	E	B	A	A
HCM 95th %tile Q(veh)	-	-	2.3	0.2	0.4	-

Intersection	
Intersection Delay, s/veh	15.2
Intersection LOS	C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	5	410	15	15	521
Future Vol, veh/h	13	5	410	15	15	521
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	14	5	427	16	16	543
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	9.3	13.2	17
HCM LOS	A	B	C

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	72%	3%
Vol Thru, %	96%	0%	97%
Vol Right, %	4%	28%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	425	18	536
LT Vol	0	13	15
Through Vol	410	0	521
RT Vol	15	5	0
Lane Flow Rate	443	19	558
Geometry Grp	1	1	1
Degree of Util (X)	0.56	0.031	0.693
Departure Headway (Hd)	4.553	6.044	4.469
Convergence, Y/N	Yes	Yes	Yes
Cap	792	589	810
Service Time	2.577	4.111	2.492
HCM Lane V/C Ratio	0.559	0.032	0.689
HCM Control Delay	13.2	9.3	17
HCM Lane LOS	B	A	C
HCM 95th-tile Q	3.5	0.1	5.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	38	23	461	110	0	15	389	82	8	510	12
Future Volume (veh/h)	17	38	23	461	110	0	15	389	82	8	510	12
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	18	39	24	475	113	0	15	401	85	8	526	12
Adj No. of Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	37	134	114	532	653	555	32	622	529	18	608	516
Arrive On Green	0.02	0.07	0.07	0.30	0.35	0.00	0.02	0.34	0.34	0.01	0.33	0.33
Sat Flow, veh/h	1757	1845	1568	1757	1845	1568	1757	1845	1568	1757	1845	1568
Grp Volume(v), veh/h	18	39	24	475	113	0	15	401	85	8	526	12
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	1845	1568	1757	1845	1568	1757	1845	1568
Q Serve(g_s), s	0.7	1.3	1.0	17.3	2.8	0.0	0.6	12.4	2.5	0.3	17.9	0.3
Cycle Q Clear(g_c), s	0.7	1.3	1.0	17.3	2.8	0.0	0.6	12.4	2.5	0.3	17.9	0.3
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	37	134	114	532	653	555	32	622	529	18	608	516
V/C Ratio(X)	0.48	0.29	0.21	0.89	0.17	0.00	0.47	0.64	0.16	0.44	0.87	0.02
Avail Cap(c_a), veh/h	139	550	467	702	1141	970	131	814	692	131	814	692
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	32.5	29.5	29.3	22.4	14.9	0.0	32.6	18.8	15.6	33.0	21.1	15.2
Incr Delay (d2), s/veh	9.3	1.2	0.9	11.3	0.1	0.0	10.3	1.1	0.1	15.9	7.6	0.0
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	0.4	0.7	0.4	10.0	1.5	0.0	0.4	6.4	1.1	0.2	10.3	0.2
LnGrp Delay(d),s/veh	41.8	30.7	30.2	33.7	15.0	0.0	43.0	20.0	15.7	48.9	28.7	15.2
LnGrp LOS	D	C	C	C	B		D	B	B	D	C	B
Approach Vol, veh/h		81			588			501			546	
Approach Delay, s/veh		33.0			30.1			19.9			28.7	
Approach LOS		C			C			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.9	27.9	24.5	9.8	5.4	27.4	5.6	28.6
Change Period (Y+Rc), s	* 4.2	5.3	* 4.2	4.9	* 4.2	5.3	* 4.2	4.9
Max Green Setting (Gmax), s	* 5	29.6	* 27	20.0	* 5	29.6	* 5.3	41.5
Max Q Clear Time (g_c+I1), s	2.3	14.4	19.3	3.3	2.6	19.9	2.7	4.8
Green Ext Time (p_c), s	0.0	2.2	1.0	0.2	0.0	2.2	0.0	0.6

Intersection Summary	
HCM 2010 Ctrl Delay	26.8
HCM 2010 LOS	C

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	113	171	69	18	49	15	4	32	457	29	37	403
Future Volume (vph)	113	171	69	18	49	15	4	32	457	29	37	403
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1752	1765		1752	1845	1568		1752	1845	1568	1752	1845
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1752	1765		1752	1845	1568		1752	1845	1568	1752	1845
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	126	190	77	20	54	17	4	36	508	32	41	448
RTOR Reduction (vph)	0	20	0	0	0	15	0	0	0	19	0	0
Lane Group Flow (vph)	126	247	0	20	54	2	0	40	508	13	41	448
Turn Type	Prot	NA		Prot	NA	Perm	Prot	Prot	NA	Perm	Prot	NA
Protected Phases	7	4		3	8		5	5	2		1	6
Permitted Phases						8				2		
Actuated Green, G (s)	9.3	17.1		0.7	8.5	8.5		1.6	25.4	25.4	1.6	25.4
Effective Green, g (s)	9.3	17.1		0.7	8.5	8.5		1.6	25.4	25.4	1.6	25.4
Actuated g/C Ratio	0.15	0.27		0.01	0.13	0.13		0.03	0.40	0.40	0.03	0.40
Clearance Time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	255	473		19	245	208		43	734	624	43	734
v/s Ratio Prot	c0.07	c0.14		0.01	0.03			0.02	c0.28		c0.02	0.24
v/s Ratio Perm						0.00				0.01		
v/c Ratio	0.49	0.52		1.05	0.22	0.01		0.93	0.69	0.02	0.95	0.61
Uniform Delay, d1	25.1	19.9		31.5	24.7	24.0		31.0	16.0	11.7	31.1	15.3
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.5	1.0		224.0	0.5	0.0		110.0	2.8	0.0	118.5	1.5
Delay (s)	26.6	20.9		255.6	25.1	24.0		141.1	18.8	11.7	149.6	16.8
Level of Service	C	C		F	C	C		F	B	B	F	B
Approach Delay (s)		22.7			75.6				26.8			26.1
Approach LOS		C			E				C			C

Intersection Summary			
HCM 2000 Control Delay	28.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	63.8	Sum of lost time (s)	19.0
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	57
Future Volume (vph)	57
Ideal Flow (vphpl)	1900
Total Lost time (s)	5.3
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1568
Flt Permitted	1.00
Satd. Flow (perm)	1568
Peak-hour factor, PHF	0.90
Adj. Flow (vph)	63
RTOR Reduction (vph)	38
Lane Group Flow (vph)	25
Turn Type	Perm
Protected Phases	
Permitted Phases	6
Actuated Green, G (s)	25.4
Effective Green, g (s)	25.4
Actuated g/C Ratio	0.40
Clearance Time (s)	5.3
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	624
v/s Ratio Prot	
v/s Ratio Perm	0.02
v/c Ratio	0.04
Uniform Delay, d1	11.7
Progression Factor	1.00
Incremental Delay, d2	0.0
Delay (s)	11.8
Level of Service	B
Approach Delay (s)	
Approach LOS	

Intersection Summary

Intersection	
Int Delay, s/veh	0.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	36	483	5	28	502
Future Vol, veh/h	0	36	483	5	28	502
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	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	0	40	537	6	31	558

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	540	0	0	543	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.23	-	-	4.13	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.327	-	-	2.227	-
Pot Cap-1 Maneuver	0	540	-	-	1021	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	540	-	-	1021	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.2	0	0.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	540	1021	-
HCM Lane V/C Ratio	-	-	0.074	0.03	-
HCM Control Delay (s)	-	-	12.2	8.6	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	11	476	6	22	500
Future Vol, veh/h	20	11	476	6	22	500
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	250	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	22	12	529	7	24	556

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1137	533	0	0	536	0
Stage 1	533	-	-	-	-	-
Stage 2	604	-	-	-	-	-
Critical Hdwy	6.43	6.23	-	-	4.13	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	-	-	2.227	-
Pot Cap-1 Maneuver	222	545	-	-	1027	-
Stage 1	586	-	-	-	-	-
Stage 2	544	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	214	545	-	-	1027	-
Mov Cap-2 Maneuver	214	-	-	-	-	-
Stage 1	566	-	-	-	-	-
Stage 2	544	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.5	0	0.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	214	545	1027	-
HCM Lane V/C Ratio	-	-	0.104	0.022	0.024	-
HCM Control Delay (s)	-	-	23.8	11.8	8.6	0
HCM Lane LOS	-	-	C	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	0.1	-

Intersection	
Intersection Delay, s/veh	16.3
Intersection LOS	C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	9	11	471	8	3	522
Future Vol, veh/h	9	11	471	8	3	522
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	9	12	496	8	3	549
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	9.2	15.4	17.3
HCM LOS	A	C	C

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	45%	1%
Vol Thru, %	98%	0%	99%
Vol Right, %	2%	55%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	479	20	525
LT Vol	0	9	3
Through Vol	471	0	522
RT Vol	8	11	0
Lane Flow Rate	504	21	553
Geometry Grp	1	1	1
Degree of Util (X)	0.64	0.035	0.696
Departure Headway (Hd)	4.571	5.935	4.536
Convergence, Y/N	Yes	Yes	Yes
Cap	792	599	796
Service Time	2.6	4.012	2.564
HCM Lane V/C Ratio	0.636	0.035	0.695
HCM Control Delay	15.4	9.2	17.3
HCM Lane LOS	C	A	C
HCM 95th-tile Q	4.7	0.1	5.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	62	31	201	47	7	6	445	157	5	490	15
Future Volume (veh/h)	24	62	31	201	47	7	6	445	157	5	490	15
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	26	68	34	221	52	8	7	489	173	5	538	16
Adj No. of Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	53	172	146	281	411	350	16	672	571	12	667	567
Arrive On Green	0.03	0.09	0.09	0.16	0.22	0.22	0.01	0.36	0.36	0.01	0.36	0.36
Sat Flow, veh/h	1757	1845	1568	1757	1845	1568	1757	1845	1568	1757	1845	1568
Grp Volume(v), veh/h	26	68	34	221	52	8	7	489	173	5	538	16
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	1845	1568	1757	1845	1568	1757	1845	1568
Q Serve(g_s), s	0.7	1.7	1.0	6.0	1.1	0.2	0.2	11.4	3.9	0.1	13.0	0.3
Cycle Q Clear(g_c), s	0.7	1.7	1.0	6.0	1.1	0.2	0.2	11.4	3.9	0.1	13.0	0.3
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	53	172	146	281	411	350	16	672	571	12	667	567
V/C Ratio(X)	0.49	0.39	0.23	0.79	0.13	0.02	0.43	0.73	0.30	0.42	0.81	0.03
Avail Cap(c_a), veh/h	199	745	633	525	1088	925	177	1178	1001	177	1178	1001
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	23.6	21.1	20.8	20.0	15.4	15.0	24.4	13.6	11.2	24.5	14.2	10.2
Incr Delay (d2), s/veh	6.7	1.5	0.8	4.9	0.1	0.0	16.9	1.5	0.3	22.4	2.4	0.0
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	0.4	0.9	0.5	3.3	0.6	0.1	0.2	6.0	1.7	0.1	7.0	0.1
LnGrp Delay(d),s/veh	30.4	22.6	21.6	24.8	15.5	15.0	41.3	15.1	11.5	46.8	16.6	10.2
LnGrp LOS	C	C	C	C	B	B	D	B	B	D	B	B
Approach Vol, veh/h		128			281			669			559	
Approach Delay, s/veh		23.9			22.8			14.5			16.7	
Approach LOS		C			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.5	23.3	12.1	9.5	4.7	23.2	5.7	15.9
Change Period (Y+Rc), s	* 4.2	5.3	* 4.2	4.9	* 4.2	5.3	* 4.2	4.9
Max Green Setting (Gmax), s	* 5	31.6	* 15	20.0	* 5	31.6	* 5.6	29.2
Max Q Clear Time (g_c+I1), s	2.1	13.4	8.0	3.7	2.2	15.0	2.7	3.1
Green Ext Time (p_c), s	0.0	3.2	0.3	0.3	0.0	2.9	0.0	0.2

Intersection Summary	
HCM 2010 Ctrl Delay	17.4
HCM 2010 LOS	B

Notes

Intersection: 1: Fowler Avenue & Clinton Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	UL	T	R	L	T	R
Maximum Queue (ft)	84	126	139	162	79	130	207	100	47	383	100
Average Queue (ft)	23	45	44	74	23	64	112	21	14	202	38
95th Queue (ft)	55	96	96	128	56	118	185	70	39	352	74
Link Distance (ft)		2643		1265			1232			2590	2590
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	150		225		105	175		40	255		
Storage Blk Time (%)				3			20	1		6	
Queuing Penalty (veh)				2			31	4		1	

Intersection: 2: Fowler Avenue & Kerry Avenue

Movement	WB	SB
Directions Served	R	L
Maximum Queue (ft)	94	69
Average Queue (ft)	41	27
95th Queue (ft)	70	57
Link Distance (ft)	2454	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		250
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Fowler Avenue & McKinley Avenue

Movement	WB	WB	SB
Directions Served	L	R	LT
Maximum Queue (ft)	53	54	120
Average Queue (ft)	31	23	49
95th Queue (ft)	58	49	112
Link Distance (ft)		2582	1215
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	250		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Fowler Avenue & Floradora Avenue

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	28	144	214
Average Queue (ft)	15	89	100
95th Queue (ft)	36	133	159
Link Distance (ft)	1268	1274	1366
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Fowler Avenue & Olive Avenue

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	L	T	R	L	T	R
Maximum Queue (ft)	65	66	42	299	375	26	280	43	44	287	18
Average Queue (ft)	14	25	17	202	83	12	113	19	10	175	4
95th Queue (ft)	40	54	38	304	246	30	207	35	33	260	15
Link Distance (ft)		2645			2569		2536			1274	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	185		250	200		250		250	250		250
Storage Blk Time (%)				12	0		0			1	
Queuing Penalty (veh)				13	1		0			0	

Network Summary

Network wide Queuing Penalty: 53

Intersection: 1: Fowler Avenue & Clinton Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	UL	T	R	L	T	R
Maximum Queue (ft)	174	151	55	89	31	73	207	100	89	223	43
Average Queue (ft)	55	77	16	26	11	26	106	14	21	101	13
95th Queue (ft)	102	143	47	64	32	58	174	49	53	179	30
Link Distance (ft)		2641		1266			1232			2626	2626
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	150		225		105	175		40	255		
Storage Blk Time (%)	1	0		0			22	0			
Queuing Penalty (veh)	2	0		0			15	2			

Intersection: 2: Fowler Avenue & Kerry Avenue

Movement	WB	SB
Directions Served	R	L
Maximum Queue (ft)	31	63
Average Queue (ft)	23	14
95th Queue (ft)	44	42
Link Distance (ft)	2454	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		250
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Fowler Avenue & McKinley Avenue

Movement	WB	WB	SB
Directions Served	L	R	LT
Maximum Queue (ft)	70	25	76
Average Queue (ft)	13	7	7
95th Queue (ft)	45	25	36
Link Distance (ft)		2582	1215
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	250		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Fowler Avenue & Floradora Avenue

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	31	181	170
Average Queue (ft)	11	94	83
95th Queue (ft)	32	153	124
Link Distance (ft)	1268	1274	1366
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Fowler Avenue & Olive Avenue

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	T	R
Maximum Queue (ft)	48	46	63	176	85	21	24	164	66	286	21
Average Queue (ft)	13	30	16	88	24	2	2	78	26	99	4
95th Queue (ft)	38	54	43	145	63	10	12	146	53	174	15
Link Distance (ft)		2645			2569			2536		1274	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	185		250	200		250	250		250		250
Storage Blk Time (%)										0	
Queuing Penalty (veh)										0	

Network Summary

Network wide Queuing Penalty: 19

Appendix G: Near Term plus Project Traffic Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	49	89	36	102	190	74	48	104	557	65	48	774
Future Volume (vph)	49	89	36	102	190	74	48	104	557	65	48	774
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1752	1765		1752	1845	1568		1752	1845	1568	1752	1845
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1752	1765		1752	1845	1568		1752	1845	1568	1752	1845
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	57	103	42	119	221	86	56	121	648	76	56	900
RTOR Reduction (vph)	0	11	0	0	0	71	0	0	0	32	0	0
Lane Group Flow (vph)	57	134	0	119	221	15	0	177	648	44	56	900
Confl. Peds. (#/hr)								3				
Turn Type	Prot	NA		Prot	NA	Perm	Prot	Prot	NA	Perm	Prot	NA
Protected Phases	7	4		3	8		5	5	2		1	6
Permitted Phases						8				2		
Actuated Green, G (s)	6.0	19.9		10.8	24.7	24.7		15.4	80.8	80.8	7.6	73.0
Effective Green, g (s)	6.0	19.9		10.8	24.7	24.7		15.4	80.8	80.8	7.6	73.0
Actuated g/C Ratio	0.04	0.14		0.08	0.18	0.18		0.11	0.59	0.59	0.06	0.53
Clearance Time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	76	254		137	329	280		195	1079	917	96	975
v/s Ratio Prot	0.03	0.08		c0.07	c0.12			c0.10	0.35		0.03	c0.49
v/s Ratio Perm						0.01				0.03		
v/c Ratio	0.75	0.53		0.87	0.67	0.05		0.91	0.60	0.05	0.58	0.92
Uniform Delay, d1	65.3	54.7		62.9	52.9	47.0		60.6	18.3	12.2	63.7	30.0
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	33.4	2.0		40.1	5.3	0.1		39.2	0.9	0.0	8.7	13.8
Delay (s)	98.7	56.7		103.1	58.2	47.1		99.9	19.3	12.3	72.4	43.8
Level of Service	F	E		F	E	D		F	B	B	E	D
Approach Delay (s)		68.6			68.5				34.5			39.4
Approach LOS		E			E				C			D

Intersection Summary			
HCM 2000 Control Delay	44.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	138.1	Sum of lost time (s)	19.0
Intersection Capacity Utilization	79.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	229
Future Volume (vph)	229
Ideal Flow (vphpl)	1900
Total Lost time (s)	5.3
Lane Util. Factor	1.00
Frpb, ped/bikes	1.00
Flpb, ped/bikes	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1568
Flt Permitted	1.00
Satd. Flow (perm)	1568
Peak-hour factor, PHF	0.86
Adj. Flow (vph)	266
RTOR Reduction (vph)	71
Lane Group Flow (vph)	195
Confl. Peds. (#/hr)	
Turn Type	Perm
Protected Phases	
Permitted Phases	6
Actuated Green, G (s)	73.0
Effective Green, g (s)	73.0
Actuated g/C Ratio	0.53
Clearance Time (s)	5.3
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	828
v/s Ratio Prot	
v/s Ratio Perm	0.12
v/c Ratio	0.24
Uniform Delay, d1	17.5
Progression Factor	1.00
Incremental Delay, d2	0.1
Delay (s)	17.7
Level of Service	B
Approach Delay (s)	
Approach LOS	

Intersection Summary

Intersection	
Int Delay, s/veh	2.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	175	582	31	128	832
Future Vol, veh/h	0	175	582	31	128	832
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	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	0	203	677	36	149	967

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	695	0	0	713	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.23	-	-	4.13	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.327	-	-	2.227	-
Pot Cap-1 Maneuver	0	440	-	-	882	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	440	-	-	882	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20	0	1.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	440	882	-
HCM Lane V/C Ratio	-	-	0.462	0.169	-
HCM Control Delay (s)	-	-	20	9.9	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	2.4	0.6	-

Intersection	
Int Delay, s/veh	20.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	85	39	569	32	101	728
Future Vol, veh/h	85	39	569	32	101	728
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	250	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	99	45	662	37	117	847

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1762	681	0	0	699	0
Stage 1	681	-	-	-	-	-
Stage 2	1081	-	-	-	-	-
Critical Hdwy	6.43	6.23	-	-	4.13	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	-	-	2.227	-
Pot Cap-1 Maneuver	~ 92	449	-	-	893	-
Stage 1	501	-	-	-	-	-
Stage 2	324	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 69	449	-	-	893	-
Mov Cap-2 Maneuver	~ 69	-	-	-	-	-
Stage 1	377	-	-	-	-	-
Stage 2	324	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	252.6	0	1.2
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	69	449	893	-
HCM Lane V/C Ratio	-	-	1.432	0.101	0.132	-
HCM Control Delay (s)	-	-	$ 362.1	13.9	9.6	0
HCM Lane LOS	-	-	F	B	A	A
HCM 95th %tile Q(veh)	-	-	8.2	0.3	0.5	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Intersection Delay, s/veh	66.6
Intersection LOS	F

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	16	5	602	19	15	811
Future Vol, veh/h	16	5	602	19	15	811
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	17	5	627	20	16	845
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	10.5	31.1	94.7
HCM LOS	B	D	F

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	76%	2%
Vol Thru, %	97%	0%	98%
Vol Right, %	3%	24%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	621	21	826
LT Vol	0	16	15
Through Vol	602	0	811
RT Vol	19	5	0
Lane Flow Rate	647	22	860
Geometry Grp	1	1	1
Degree of Util (X)	0.865	0.042	1.131
Departure Headway (Hd)	4.977	7.192	4.733
Convergence, Y/N	Yes	Yes	Yes
Cap	731	501	766
Service Time	2.977	5.192	2.773
HCM Lane V/C Ratio	0.885	0.044	1.123
HCM Control Delay	31.1	10.5	94.7
HCM Lane LOS	D	B	F
HCM 95th-tile Q	10.4	0.1	25.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	41	51	23	471	116	1	21	565	86	8	766	49
Future Volume (veh/h)	41	51	23	471	116	1	21	565	86	8	766	49
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	42	53	24	486	120	1	22	582	89	8	790	51
Adj No. of Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	57	88	75	522	576	490	39	880	748	17	858	729
Arrive On Green	0.03	0.05	0.05	0.30	0.31	0.31	0.02	0.48	0.48	0.01	0.46	0.46
Sat Flow, veh/h	1757	1845	1568	1757	1845	1568	1757	1845	1568	1757	1845	1568
Grp Volume(v), veh/h	42	53	24	486	120	1	22	582	89	8	790	51
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	1845	1568	1757	1845	1568	1757	1845	1568
Q Serve(g_s), s	2.6	3.1	1.6	29.8	5.3	0.0	1.4	26.7	3.5	0.5	44.5	2.0
Cycle Q Clear(g_c), s	2.6	3.1	1.6	29.8	5.3	0.0	1.4	26.7	3.5	0.5	44.5	2.0
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	57	88	75	522	576	490	39	880	748	17	858	729
V/C Ratio(X)	0.73	0.60	0.32	0.93	0.21	0.00	0.56	0.66	0.12	0.46	0.92	0.07
Avail Cap(c_a), veh/h	146	332	283	662	874	743	79	1074	913	79	1074	913
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	53.2	51.8	51.1	37.9	28.0	26.2	53.7	22.1	16.1	54.6	27.8	16.4
Incr Delay (d2), s/veh	16.2	6.4	2.4	17.3	0.2	0.0	12.2	1.1	0.1	18.0	11.0	0.0
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	1.5	1.7	0.8	17.0	2.7	0.0	0.8	13.9	1.5	0.3	25.2	0.9
LnGrp Delay(d),s/veh	69.4	58.1	53.5	55.2	28.2	26.2	65.9	23.3	16.1	72.6	38.7	16.5
LnGrp LOS	E	E	D	E	C	C	E	C	B	E	D	B
Approach Vol, veh/h		119			607			693			849	
Approach Delay, s/veh		61.2			49.8			23.7			37.7	
Approach LOS		E			D			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.3	58.3	37.2	10.2	6.7	56.9	7.8	39.6
Change Period (Y+Rc), s	* 4.2	5.3	* 4.2	4.9	* 4.2	5.3	* 4.2	4.9
Max Green Setting (Gmax), s	* 5	64.6	* 42	20.0	* 5	64.6	* 9.2	52.6
Max Q Clear Time (g_c+I1), s	2.5	28.7	31.8	5.1	3.4	46.5	4.6	7.3
Green Ext Time (p_c), s	0.0	4.1	1.2	0.2	0.0	5.1	0.0	0.6

Intersection Summary		
HCM 2010 Ctrl Delay		37.9
HCM 2010 LOS		D

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	137	206	76	56	69	62	21	38	681	79	82	598
Future Volume (vph)	137	206	76	56	69	62	21	38	681	79	82	598
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1752	1770		1752	1845	1568		1752	1845	1568	1752	1845
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1752	1770		1752	1845	1568		1752	1845	1568	1752	1845
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	152	229	84	62	77	69	23	42	757	88	91	664
RTOR Reduction (vph)	0	12	0	0	0	61	0	0	0	47	0	0
Lane Group Flow (vph)	152	301	0	62	77	8	0	65	757	41	91	664
Turn Type	Prot	NA		Prot	NA	Perm	Prot	Prot	NA	Perm	Prot	NA
Protected Phases	7	4		3	8		5	5	2		1	6
Permitted Phases						8				2		
Actuated Green, G (s)	18.7	23.4		6.9	11.6	11.6		14.3	48.5	48.5	7.1	41.3
Effective Green, g (s)	18.7	23.4		6.9	11.6	11.6		14.3	48.5	48.5	7.1	41.3
Actuated g/C Ratio	0.18	0.22		0.07	0.11	0.11		0.14	0.46	0.46	0.07	0.39
Clearance Time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	312	394		115	204	173		238	853	724	118	726
v/s Ratio Prot	0.09	c0.17		c0.04	0.04			0.04	c0.41		c0.05	0.36
v/s Ratio Perm						0.00				0.03		
v/c Ratio	0.49	0.76		0.54	0.38	0.04		0.27	0.89	0.06	0.77	0.91
Uniform Delay, d1	38.8	38.2		47.5	43.3	41.7		40.6	25.7	15.6	48.1	30.1
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	8.5		4.8	1.2	0.1		0.6	11.0	0.0	26.2	16.0
Delay (s)	40.0	46.6		52.3	44.5	41.8		41.3	36.8	15.6	74.3	46.2
Level of Service	D	D		D	D	D		D	D	B	E	D
Approach Delay (s)		44.5			45.9				35.0			46.5
Approach LOS		D			D				D			D

Intersection Summary			
HCM 2000 Control Delay	41.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	104.9	Sum of lost time (s)	19.0
Intersection Capacity Utilization	75.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	77
Future Volume (vph)	77
Ideal Flow (vphpl)	1900
Total Lost time (s)	5.3
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1568
Flt Permitted	1.00
Satd. Flow (perm)	1568
Peak-hour factor, PHF	0.90
Adj. Flow (vph)	86
RTOR Reduction (vph)	52
Lane Group Flow (vph)	34
Turn Type	Perm
Protected Phases	
Permitted Phases	6
Actuated Green, G (s)	41.3
Effective Green, g (s)	41.3
Actuated g/C Ratio	0.39
Clearance Time (s)	5.3
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	617
v/s Ratio Prot	
v/s Ratio Perm	0.02
v/c Ratio	0.05
Uniform Delay, d1	19.7
Progression Factor	1.00
Incremental Delay, d2	0.0
Delay (s)	19.7
Level of Service	B
Approach Delay (s)	
Approach LOS	

Intersection Summary

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	61	756	42	47	744
Future Vol, veh/h	0	61	756	42	47	744
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	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	0	68	840	47	52	827

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	864	0	0	887	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.23	-	-	4.13	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.327	-	-	2.227	-
Pot Cap-1 Maneuver	0	352	-	-	759	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	352	-	-	759	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.7	0	0.6
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	352	759	-
HCM Lane V/C Ratio	-	-	0.193	0.069	-
HCM Control Delay (s)	-	-	17.7	10.1	-
HCM Lane LOS	-	-	C	B	-
HCM 95th %tile Q(veh)	-	-	0.7	0.2	-

Intersection	
Int Delay, s/veh	1.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	31	25	772	25	22	738
Future Vol, veh/h	31	25	772	25	22	738
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	250	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	34	28	858	28	24	820

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1740	872	0	0	886	0
Stage 1	872	-	-	-	-	-
Stage 2	868	-	-	-	-	-
Critical Hdwy	6.43	6.23	-	-	4.13	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	-	-	2.227	-
Pot Cap-1 Maneuver	95	348	-	-	760	-
Stage 1	407	-	-	-	-	-
Stage 2	409	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	89	348	-	-	760	-
Mov Cap-2 Maneuver	89	-	-	-	-	-
Stage 1	383	-	-	-	-	-
Stage 2	409	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	45.4	0	0.3
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	89	348	760	-
HCM Lane V/C Ratio	-	-	0.387	0.08	0.032	-
HCM Control Delay (s)	-	-	69	16.2	9.9	0
HCM Lane LOS	-	-	F	C	A	A
HCM 95th %tile Q(veh)	-	-	1.5	0.3	0.1	-

Intersection	
Intersection Delay, s/veh	96.4
Intersection LOS	F

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	17	11	799	16	3	781
Future Vol, veh/h	17	11	799	16	3	781
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	18	12	841	17	3	822
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	10.8	105	90.6
HCM LOS	B	F	F

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	61%	0%
Vol Thru, %	98%	0%	100%
Vol Right, %	2%	39%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	815	28	784
LT Vol	0	17	3
Through Vol	799	0	781
RT Vol	16	11	0
Lane Flow Rate	858	29	825
Geometry Grp	1	1	1
Degree of Util (X)	1.156	0.057	1.115
Departure Headway (Hd)	5.007	7.389	5.055
Convergence, Y/N	Yes	Yes	Yes
Cap	729	488	726
Service Time	3.007	5.389	3.055
HCM Lane V/C Ratio	1.177	0.059	1.136
HCM Control Delay	105	10.8	90.6
HCM Lane LOS	F	B	F
HCM 95th-tile Q	26	0.2	23.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	82	79	31	212	60	8	15	733	178	5	727	45
Future Volume (veh/h)	82	79	31	212	60	8	15	733	178	5	727	45
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	90	87	34	233	66	9	16	805	196	5	799	49
Adj No. of Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	116	145	123	277	313	266	33	916	778	12	893	759
Arrive On Green	0.07	0.08	0.08	0.16	0.17	0.17	0.02	0.50	0.50	0.01	0.48	0.48
Sat Flow, veh/h	1757	1845	1568	1757	1845	1568	1757	1845	1568	1757	1845	1568
Grp Volume(v), veh/h	90	87	34	233	66	9	16	805	196	5	799	49
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	1845	1568	1757	1845	1568	1757	1845	1568
Q Serve(g_s), s	3.6	3.3	1.5	9.2	2.2	0.3	0.6	27.8	5.1	0.2	28.1	1.2
Cycle Q Clear(g_c), s	3.6	3.3	1.5	9.2	2.2	0.3	0.6	27.8	5.1	0.2	28.1	1.2
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	116	145	123	277	313	266	33	916	778	12	893	759
V/C Ratio(X)	0.77	0.60	0.28	0.84	0.21	0.03	0.48	0.88	0.25	0.43	0.90	0.06
Avail Cap(c_a), veh/h	288	518	440	335	567	482	123	1108	942	123	1108	942
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	32.8	31.8	30.9	29.2	25.5	24.7	34.6	16.0	10.3	35.3	16.7	9.8
Incr Delay (d2), s/veh	10.4	3.9	1.2	15.0	0.3	0.1	10.2	7.2	0.2	23.2	8.2	0.0
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	2.1	1.8	0.7	5.6	1.1	0.2	0.4	15.7	2.2	0.2	16.2	0.5
LnGrp Delay(d),s/veh	43.1	35.7	32.1	44.1	25.8	24.8	44.8	23.3	10.5	58.5	25.0	9.8
LnGrp LOS	D	D	C	D	C	C	D	C	B	E	C	A
Approach Vol, veh/h		211			308			1017			853	
Approach Delay, s/veh		38.3			39.6			21.1			24.3	
Approach LOS		D			D			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.7	40.7	15.4	10.5	5.6	39.8	8.9	17.0
Change Period (Y+Rc), s	* 4.2	5.3	* 4.2	4.9	* 4.2	5.3	* 4.2	4.9
Max Green Setting (Gmax), s	* 5	42.8	* 14	20.0	* 5	42.8	* 12	21.9
Max Q Clear Time (g_c+I1), s	2.2	29.8	11.2	5.3	2.6	30.1	5.6	4.2
Green Ext Time (p_c), s	0.0	4.9	0.2	0.4	0.0	4.4	0.1	0.2

Intersection Summary	
HCM 2010 Ctrl Delay	26.2
HCM 2010 LOS	C

Notes

Intersection	
Intersection Delay, s/veh	22.4
Intersection LOS	C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	85	39	569	32	101	728
Future Vol, veh/h	85	39	569	32	101	728
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	99	45	662	37	117	847
Number of Lanes	1	1	2	1	1	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	3	3
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	3	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	3	2	0
HCM Control Delay	14.2	22.5	23.6
HCM LOS	B	C	C

Lane	NBLn1	NBLn2	NBLn3	WBLn1	WBLn2	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	0%	100%	0%	100%	0%	0%
Vol Thru, %	100%	100%	0%	0%	0%	0%	100%	100%
Vol Right, %	0%	0%	100%	0%	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	285	285	32	85	39	101	364	364
LT Vol	0	0	0	85	0	101	0	0
Through Vol	285	285	0	0	0	0	364	364
RT Vol	0	0	32	0	39	0	0	0
Lane Flow Rate	331	331	37	99	45	117	423	423
Geometry Grp	8	8	8	8	8	8	8	8
Degree of Util (X)	0.666	0.666	0.049	0.256	0.102	0.244	0.821	0.613
Departure Headway (Hd)	7.245	7.245	4.76	9.34	8.122	7.493	6.986	5.212
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	500	500	751	384	441	480	521	694
Service Time	4.981	4.981	2.496	7.097	5.879	5.226	4.719	2.944
HCM Lane V/C Ratio	0.662	0.662	0.049	0.258	0.102	0.244	0.812	0.61
HCM Control Delay	23.3	23.3	7.7	15.3	11.8	12.6	34.4	15.9
HCM Lane LOS	C	C	A	C	B	B	D	C
HCM 95th-tile Q	4.8	4.8	0.2	1	0.3	0.9	8.1	4.2

Intersection	
Intersection Delay, s/veh	18.2
Intersection LOS	C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	16	5	602	19	15	811
Future Vol, veh/h	16	5	602	19	15	811
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	17	5	627	20	16	845
Number of Lanes	1	1	2	0	1	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	3	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	3	2	0
HCM Control Delay	11.4	19.8	17.1
HCM LOS	B	C	C

Lane	NBLn1	NBLn2	WBLn1	WBLn2	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	100%	0%	100%	0%	0%
Vol Thru, %	100%	91%	0%	0%	0%	100%	100%
Vol Right, %	0%	9%	0%	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	401	220	16	5	15	406	406
LT Vol	0	0	16	0	15	0	0
Through Vol	401	201	0	0	0	406	406
RT Vol	0	19	0	5	0	0	0
Lane Flow Rate	418	229	17	5	16	422	422
Geometry Grp	8	8	8	8	8	8	8
Degree of Util (X)	0.723	0.392	0.04	0.011	0.029	0.717	0.511
Departure Headway (Hd)	6.225	6.164	8.647	7.424	6.615	6.112	4.351
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	581	583	414	481	541	591	828
Service Time	3.956	3.896	6.412	5.188	4.354	3.851	2.089
HCM Lane V/C Ratio	0.719	0.393	0.041	0.01	0.03	0.714	0.51
HCM Control Delay	23.6	12.8	11.8	10.3	9.6	22.9	11.6
HCM Lane LOS	C	B	B	B	A	C	B
HCM 95th-tile Q	6	1.9	0.1	0	0.1	5.9	3

Intersection	
Intersection Delay, s/veh	24
Intersection LOS	C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	31	25	772	25	22	738
Future Vol, veh/h	31	25	772	25	22	738
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	34	28	858	28	24	820
Number of Lanes	1	1	2	1	1	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	3	3
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	3	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	3	2	0
HCM Control Delay	12.1	27.9	20.8
HCM LOS	B	D	C

Lane	NBLn1	NBLn2	NBLn3	WBLn1	WBLn2	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	0%	100%	0%	100%	0%	0%
Vol Thru, %	100%	100%	0%	0%	0%	0%	100%	100%
Vol Right, %	0%	0%	100%	0%	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	386	386	25	31	25	22	369	369
LT Vol	0	0	0	31	0	22	0	0
Through Vol	386	386	0	0	0	0	369	369
RT Vol	0	0	25	0	25	0	0	0
Lane Flow Rate	429	429	28	34	28	24	410	410
Geometry Grp	8	8	8	8	8	8	8	8
Degree of Util (X)	0.778	0.778	0.031	0.088	0.062	0.049	0.765	0.564
Departure Headway (Hd)	6.528	6.528	4.063	9.245	8.026	7.218	6.715	4.954
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	553	553	873	390	449	494	537	722
Service Time	4.289	4.289	1.824	6.945	5.726	4.99	4.487	2.725
HCM Lane V/C Ratio	0.776	0.776	0.032	0.087	0.062	0.049	0.764	0.568
HCM Control Delay	28.6	28.6	7	12.8	11.3	10.4	28.3	14
HCM Lane LOS	D	D	A	B	B	B	D	B
HCM 95th-tile Q	7.1	7.1	0.1	0.3	0.2	0.2	6.8	3.6

Intersection	
Intersection Delay, s/veh	31.6
Intersection LOS	D

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	17	11	799	16	3	781
Future Vol, veh/h	17	11	799	16	3	781
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	18	12	841	17	3	822
Number of Lanes	1	1	2	0	1	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	3	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	3	2	0
HCM Control Delay	11.8	43.6	19.8
HCM LOS	B	E	C

Lane	NBLn1	NBLn2	WBLn1	WBLn2	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	100%	0%	100%	0%	0%
Vol Thru, %	100%	94%	0%	0%	0%	100%	100%
Vol Right, %	0%	6%	0%	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	533	282	17	11	3	391	391
LT Vol	0	0	17	0	3	0	0
Through Vol	533	266	0	0	0	391	391
RT Vol	0	16	0	11	0	0	0
Lane Flow Rate	561	297	18	12	3	411	411
Geometry Grp	8	8	8	8	8	8	8
Degree of Util (X)	0.983	0.518	0.045	0.025	0.006	0.749	0.547
Departure Headway (Hd)	6.311	6.271	9.112	7.882	7.064	6.56	4.795
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	578	574	392	452	506	551	748
Service Time	4.049	4.01	6.897	5.667	4.817	4.313	2.549
HCM Lane V/C Ratio	0.971	0.517	0.046	0.027	0.006	0.746	0.549
HCM Control Delay	58.4	15.6	12.3	10.9	9.9	26.4	13.2
HCM Lane LOS	F	C	B	B	A	D	B
HCM 95th-tile Q	13.9	3	0.1	0.1	0	6.5	3.4

Intersection: 1: Fowler Avenue & Clinton Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	UL	T	R	L	T	R
Maximum Queue (ft)	123	172	158	332	180	265	510	100	359	678	64
Average Queue (ft)	41	81	93	168	55	155	271	28	53	396	30
95th Queue (ft)	89	151	148	289	148	265	480	93	162	574	55
Link Distance (ft)		2643		1265			1232			2590	2590
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	150		225		105	175		40	255		
Storage Blk Time (%)		1		26		6	33	0		21	
Queuing Penalty (veh)		1		46		39	72	3		10	

Intersection: 2: Fowler Avenue & Kerry Avenue

Movement	WB	SB
Directions Served	R	L
Maximum Queue (ft)	118	76
Average Queue (ft)	63	44
95th Queue (ft)	98	77
Link Distance (ft)	2454	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		250
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Fowler Avenue & McKinley Avenue

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	48	41	217	164	72	87	126	109
Average Queue (ft)	23	12	127	82	19	42	71	58
95th Queue (ft)	43	27	204	153	52	69	103	87
Link Distance (ft)		2552	1354	1354			575	575
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	250				250	250		
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 4: Fowler Avenue & Floradora Avenue

Movement	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	R	T	TR	L	T	T
Maximum Queue (ft)	27	25	150	92	31	149	117
Average Queue (ft)	8	5	71	59	12	96	61
95th Queue (ft)	28	21	115	86	37	147	104
Link Distance (ft)		1256	617	617		1354	1354
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	250				250		
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 5: Fowler Avenue & Olive Avenue

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	L	T	R	L	T	R
Maximum Queue (ft)	71	148	42	300	622	48	374	364	46	641	370
Average Queue (ft)	26	39	12	259	268	17	209	29	9	296	58
95th Queue (ft)	59	101	29	347	607	45	339	133	33	556	259
Link Distance (ft)		2645			2569		2536			602	
Upstream Blk Time (%)										1	
Queuing Penalty (veh)										9	
Storage Bay Dist (ft)	185		250	200		250		250	250		250
Storage Blk Time (%)				30	0		5			14	
Queuing Penalty (veh)				36	1		5			8	

Network Summary

Network wide Queuing Penalty: 229

Intersection: 1: Fowler Avenue & Clinton Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	UL	T	R	L	T	R
Maximum Queue (ft)	174	212	98	96	49	264	697	100	360	523	54
Average Queue (ft)	81	136	50	49	28	72	388	48	74	232	17
95th Queue (ft)	153	203	89	100	43	204	612	120	210	400	40
Link Distance (ft)		2641		1266			1232			2626	2626
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	150		225		105	175		40	255		
Storage Blk Time (%)	3	8		0			46	1		5	
Queuing Penalty (veh)	7	11		0			63	10		4	

Intersection: 2: Fowler Avenue & Kerry Avenue

Movement	WB	NB	SB
Directions Served	R	TR	L
Maximum Queue (ft)	55	22	109
Average Queue (ft)	33	1	28
95th Queue (ft)	55	10	63
Link Distance (ft)	2454	616	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			250
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Fowler Avenue & McKinley Avenue

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	25	34	210	188	54	50	111	79
Average Queue (ft)	12	13	106	69	18	17	66	56
95th Queue (ft)	29	27	165	134	46	43	90	77
Link Distance (ft)		2552	1354	1354			544	544
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	250				250	250		
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 4: Fowler Avenue & Floradora Avenue

Movement	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	R	T	TR	L	T	T
Maximum Queue (ft)	45	26	127	102	31	130	136
Average Queue (ft)	15	7	71	60	4	87	57
95th Queue (ft)	38	25	104	86	20	118	99
Link Distance (ft)		1256	629	629		1354	1354
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	250				250		
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 5: Fowler Avenue & Olive Avenue

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	112	167	40	264	187	43	47	362	355	27	293	37
Average Queue (ft)	45	53	11	147	48	5	11	195	40	6	177	9
95th Queue (ft)	82	109	28	250	104	22	35	322	143	24	286	26
Link Distance (ft)		2645			2569			2536			590	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	185		250	200		250	250		250	250		250
Storage Blk Time (%)		0		6	0			3			2	
Queuing Penalty (veh)		0		4	0			7			1	

Network Summary

Network wide Queuing Penalty: 107

Appendix H: Cumulative Year 2035 No Project Traffic Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	49	89	41	338	202	96	34	81	511	179	48	573
Future Volume (vph)	49	89	41	338	202	96	34	81	511	179	48	573
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.95		1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1752	1758		1752	1845	1568		1752	1845	1568	1752	1845
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1752	1758		1752	1845	1568		1752	1845	1568	1752	1845
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	52	94	43	356	213	101	36	85	538	188	51	603
RTOR Reduction (vph)	0	15	0	0	0	70	0	0	0	73	0	0
Lane Group Flow (vph)	52	122	0	356	213	31	0	121	538	115	51	603
Confl. Peds. (#/hr)								3				
Turn Type	Prot	NA		Prot	NA	Perm	Prot	Prot	NA	Perm	Prot	NA
Protected Phases	7	4		3	8		5	5	2		1	6
Permitted Phases						8				2		
Actuated Green, G (s)	6.9	16.3		26.2	35.6	35.6		9.6	48.0	48.0	5.1	43.5
Effective Green, g (s)	6.9	16.3		26.2	35.6	35.6		9.6	48.0	48.0	5.1	43.5
Actuated g/C Ratio	0.06	0.14		0.23	0.31	0.31		0.08	0.42	0.42	0.04	0.38
Clearance Time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	105	250		400	573	487		146	772	656	77	700
v/s Ratio Prot	0.03	c0.07		c0.20	0.12			c0.07	0.29		0.03	c0.33
v/s Ratio Perm						0.02				0.07		
v/c Ratio	0.50	0.49		0.89	0.37	0.06		0.83	0.70	0.18	0.66	0.86
Uniform Delay, d1	52.2	45.3		42.8	30.8	27.8		51.7	27.3	20.9	53.9	32.8
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.6	1.5		21.0	0.4	0.1		30.5	2.8	0.1	19.4	10.6
Delay (s)	55.8	46.8		63.9	31.2	27.8		82.1	30.1	21.0	73.3	43.4
Level of Service	E	D		E	C	C		F	C	C	E	D
Approach Delay (s)		49.3			48.0				35.5			39.9
Approach LOS		D			D				D			D

Intersection Summary			
HCM 2000 Control Delay	41.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	114.6	Sum of lost time (s)	19.0
Intersection Capacity Utilization	78.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	229
Future Volume (vph)	229
Ideal Flow (vphpl)	1900
Total Lost time (s)	5.3
Lane Util. Factor	1.00
Frpb, ped/bikes	1.00
Flpb, ped/bikes	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1568
Flt Permitted	1.00
Satd. Flow (perm)	1568
Peak-hour factor, PHF	0.95
Adj. Flow (vph)	241
RTOR Reduction (vph)	112
Lane Group Flow (vph)	129
Confl. Peds. (#/hr)	
Turn Type	Perm
Protected Phases	
Permitted Phases	6
Actuated Green, G (s)	43.5
Effective Green, g (s)	43.5
Actuated g/C Ratio	0.38
Clearance Time (s)	5.3
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	595
v/s Ratio Prot	
v/s Ratio Perm	0.08
v/c Ratio	0.22
Uniform Delay, d1	24.0
Progression Factor	1.00
Incremental Delay, d2	0.2
Delay (s)	24.2
Level of Service	C
Approach Delay (s)	
Approach LOS	

Intersection Summary

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	51	34	206	256	94	55	295	600	148	0	772	95
Future Vol, veh/h	51	34	206	256	94	55	295	600	148	0	772	95
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	250	-	-	250	-	-	250	-	-	250	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	55	37	224	278	102	60	321	652	161	0	839	103

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2347	2346	891	2396	2317	733	942	0	0	813	0	0
Stage 1	891	891	-	1375	1375	-	-	-	-	-	-	-
Stage 2	1456	1455	-	1021	942	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.13	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	~ 25	~ 36	340	~ 23	~ 37	419	724	-	-	809	-	-
Stage 1	336	359	-	~ 179	212	-	-	-	-	-	-	-
Stage 2	161	194	-	284	340	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	~ 20	340	-	~ 21	419	724	-	-	809	-	-
Mov Cap-2 Maneuver	-	~ 20	-	-	~ 21	-	-	-	-	-	-	-
Stage 1	187	359	-	~ 100	118	-	-	-	-	-	-	-
Stage 2	~ 10	108	-	~ 87	340	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			3.9	0
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	724	-	-	-	104	-	32	809	-	-
HCM Lane V/C Ratio	0.443	-	-	-	2.508	-	5.061	-	-	-
HCM Control Delay (s)	13.9	-	-	-	$ 771.7	-	$ 2075.8	0	-	-
HCM Lane LOS	B	-	-	-	F	-	F	A	-	-
HCM 95th %tile Q(veh)	2.3	-	-	-	23.7	-	19.4	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Intersection Delay, s/veh	297.1
Intersection LOS	F

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	16	2	1052	19	15	1228
Future Vol, veh/h	16	2	1052	19	15	1228
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	17	2	1096	20	16	1279
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	11.9	239.8	350.6
HCM LOS	B	F	F

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	89%	1%
Vol Thru, %	98%	0%	99%
Vol Right, %	2%	11%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	1071	18	1243
LT Vol	0	16	15
Through Vol	1052	0	1228
RT Vol	19	2	0
Lane Flow Rate	1116	19	1295
Geometry Grp	1	1	1
Degree of Util (X)	1.479	0.037	1.734
Departure Headway (Hd)	5.485	8.592	5.281
Convergence, Y/N	Yes	Yes	Yes
Cap	669	419	699
Service Time	3.485	6.592	3.281
HCM Lane V/C Ratio	1.668	0.045	1.853
HCM Control Delay	239.8	11.9	350.6
HCM Lane LOS	F	B	F
HCM 95th-tile Q	47	0.1	69

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	141	168	35	591	497	3	38	912	149	30	1110	104
Future Volume (vph)	141	168	35	591	497	3	38	912	149	30	1110	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	4.9	4.9	4.2	4.9	4.9	4.2	5.3	5.3	4.2	5.3	5.3
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	1845	1568	1752	1845	1568	1752	1845	1568	1752	1845	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1752	1845	1568	1752	1845	1568	1752	1845	1568	1752	1845	1568
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	145	173	36	609	512	3	39	940	154	31	1144	107
RTOR Reduction (vph)	0	0	31	0	0	2	0	0	56	0	0	56
Lane Group Flow (vph)	145	173	5	609	512	1	39	940	98	31	1144	51
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	13.4	18.8	18.8	36.9	42.3	42.3	3.9	69.7	69.7	3.9	69.7	69.7
Effective Green, g (s)	13.4	18.8	18.8	36.9	42.3	42.3	3.9	69.7	69.7	3.9	69.7	69.7
Actuated g/C Ratio	0.09	0.13	0.13	0.25	0.29	0.29	0.03	0.47	0.47	0.03	0.47	0.47
Clearance Time (s)	4.2	4.9	4.9	4.2	4.9	4.9	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	158	234	199	437	527	448	46	869	738	46	869	738
v/s Ratio Prot	0.08	0.09		c0.35	c0.28		c0.02	0.51		0.02	c0.62	
v/s Ratio Perm			0.00			0.00			0.06			0.03
v/c Ratio	0.92	0.74	0.02	1.39	0.97	0.00	0.85	1.08	0.13	0.67	1.32	0.07
Uniform Delay, d1	66.7	62.2	56.5	55.5	52.2	37.7	71.7	39.1	22.1	71.4	39.1	21.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	47.6	11.6	0.0	190.7	31.8	0.0	76.6	55.1	0.1	32.6	150.6	0.0
Delay (s)	114.3	73.7	56.6	246.2	84.0	37.7	148.3	94.2	22.1	103.9	189.7	21.4
Level of Service	F	E	E	F	F	D	F	F	C	F	F	C
Approach Delay (s)		88.6			171.8			86.2			173.5	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	139.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.29		
Actuated Cycle Length (s)	147.9	Sum of lost time (s)	18.6
Intersection Capacity Utilization	112.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	137	206	76	207	101	62	17	31	652	313	96	600
Future Volume (vph)	137	206	76	207	101	62	17	31	652	313	96	600
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1752	1770		1752	1845	1568		1752	1845	1568	1752	1845
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1752	1770		1752	1845	1568		1752	1845	1568	1752	1845
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	146	219	81	220	107	66	18	33	694	333	102	638
RTOR Reduction (vph)	0	12	0	0	0	57	0	0	0	92	0	0
Lane Group Flow (vph)	146	288	0	220	107	9	0	51	694	241	102	638
Turn Type	Prot	NA		Prot	NA	Perm	Prot	Prot	NA	Perm	Prot	NA
Protected Phases	7	4		3	8		5	5	2		1	6
Permitted Phases						8				2		
Actuated Green, G (s)	23.4	23.0		15.3	14.9	14.9		3.9	45.2	45.2	8.6	49.9
Effective Green, g (s)	23.4	23.0		15.3	14.9	14.9		3.9	45.2	45.2	8.6	49.9
Actuated g/C Ratio	0.21	0.21		0.14	0.13	0.13		0.04	0.41	0.41	0.08	0.45
Clearance Time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	369	366		241	247	210		61	750	637	135	828
v/s Ratio Prot	0.08	c0.16		c0.13	0.06			0.03	c0.38		0.06	c0.35
v/s Ratio Perm						0.01				0.15		
v/c Ratio	0.40	0.79		0.91	0.43	0.04		0.84	0.93	0.38	0.76	0.77
Uniform Delay, d1	37.8	41.7		47.2	44.2	41.9		53.3	31.3	23.1	50.2	25.8
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	10.7		35.3	1.2	0.1		60.3	17.2	0.4	21.1	4.5
Delay (s)	38.5	52.4		82.5	45.4	42.0		113.6	48.5	23.5	71.3	30.2
Level of Service	D	D		F	D	D		F	D	C	E	C
Approach Delay (s)		47.8			65.6				43.9			34.0
Approach LOS		D			E				D			C

Intersection Summary			
HCM 2000 Control Delay	44.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	111.1	Sum of lost time (s)	19.0
Intersection Capacity Utilization	82.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	77
Future Volume (vph)	77
Ideal Flow (vphpl)	1900
Total Lost time (s)	5.3
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1568
Flt Permitted	1.00
Satd. Flow (perm)	1568
Peak-hour factor, PHF	0.94
Adj. Flow (vph)	82
RTOR Reduction (vph)	45
Lane Group Flow (vph)	37
Turn Type	Perm
Protected Phases	
Permitted Phases	6
Actuated Green, G (s)	49.9
Effective Green, g (s)	49.9
Actuated g/C Ratio	0.45
Clearance Time (s)	5.3
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	704
v/s Ratio Prot	
v/s Ratio Perm	0.02
v/c Ratio	0.05
Uniform Delay, d1	17.3
Progression Factor	1.00
Incremental Delay, d2	0.0
Delay (s)	17.3
Level of Service	B
Approach Delay (s)	
Approach LOS	

Intersection Summary

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	112	74	282	92	33	37	281	840	241	60	808	94
Future Vol, veh/h	112	74	282	92	33	37	281	840	241	60	808	94
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	250	-	-	250	-	-	250	-	-	250	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	122	80	307	100	36	40	305	913	262	65	878	102

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2751	2844	929	2907	2764	1044	980	0	0	1175	0	0
Stage 1	1059	1059	-	1654	1654	-	-	-	-	-	-	-
Stage 2	1692	1785	-	1253	1110	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.13	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	~ 13	~ 17	323	~ 10	~ 19	277	700	-	-	591	-	-
Stage 1	270	300	-	123	155	-	-	-	-	-	-	-
Stage 2	~ 117	133	-	210	284	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	~ 9	323	-	~ 10	277	700	-	-	591	-	-
Mov Cap-2 Maneuver	-	~ 9	-	-	~ 10	-	-	-	-	-	-	-
Stage 1	152	267	-	~ 69	87	-	-	-	-	-	-	-
Stage 2	~ 33	~ 75	-	~ 7	253	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			2.9	0.7
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	700	-	-	-	39	-	20	591	-	-
HCM Lane V/C Ratio	0.436	-	-	-	9.922	-	3.804	0.11	-	-
HCM Control Delay (s)	14.1	-	-	-	$ 4212.3	-	$ 1656.4	11.8	-	-
HCM Lane LOS	B	-	-	-	F	-	F	B	-	-
HCM 95th %tile Q(veh)	2.2	-	-	-	46.6	-	9.9	0.4	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Intersection Delay, s/veh	386.3
Intersection LOS	F

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	17	10	1369	16	3	1194
Future Vol, veh/h	17	10	1369	16	3	1194
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	18	11	1441	17	3	1257
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	12.2	443.4	328.7
HCM LOS	B	F	F

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	63%	0%
Vol Thru, %	99%	0%	100%
Vol Right, %	1%	37%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	1385	27	1197
LT Vol	0	17	3
Through Vol	1369	0	1194
RT Vol	16	10	0
Lane Flow Rate	1458	28	1260
Geometry Grp	1	1	1
Degree of Util (X)	1.942	0.055	1.681
Departure Headway (Hd)	5.492	8.696	5.723
Convergence, Y/N	Yes	Yes	Yes
Cap	671	414	643
Service Time	3.492	6.696	3.723
HCM Lane V/C Ratio	2.173	0.068	1.96
HCM Control Delay	443.4	12.2	328.7
HCM Lane LOS	F	B	F
HCM 95th-tile Q	82.9	0.2	60.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	247	394	75	373	301	45	15	1096	296	16	1057	117
Future Volume (vph)	247	394	75	373	301	45	15	1096	296	16	1057	117
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	4.9	4.9	4.2	4.9	4.9	4.2	5.3	5.3	4.2	5.3	5.3
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	1845	1568	1752	1845	1568	1752	1845	1568	1752	1845	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1752	1845	1568	1752	1845	1568	1752	1845	1568	1752	1845	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	268	428	82	405	327	49	16	1191	322	17	1149	127
RTOR Reduction (vph)	0	0	63	0	0	39	0	0	70	0	0	38
Lane Group Flow (vph)	268	428	19	405	327	10	16	1191	252	17	1149	89
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	23.8	29.1	29.1	24.8	30.1	30.1	1.9	72.6	72.6	1.9	72.6	72.6
Effective Green, g (s)	23.8	29.1	29.1	24.8	30.1	30.1	1.9	72.6	72.6	1.9	72.6	72.6
Actuated g/C Ratio	0.16	0.20	0.20	0.17	0.20	0.20	0.01	0.49	0.49	0.01	0.49	0.49
Clearance Time (s)	4.2	4.9	4.9	4.2	4.9	4.9	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	283	365	310	295	377	321	22	911	774	22	911	774
v/s Ratio Prot	0.15	c0.23		c0.23	0.18		0.01	c0.65		c0.01	0.62	
v/s Ratio Perm			0.01			0.01			0.16			0.06
v/c Ratio	0.95	1.17	0.06	1.37	0.87	0.03	0.73	1.31	0.33	0.77	1.26	0.12
Uniform Delay, d1	61.0	59.0	47.9	61.1	56.5	46.8	72.3	37.2	22.4	72.3	37.2	20.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	39.0	102.9	0.1	187.9	18.5	0.0	76.4	146.3	0.2	93.0	126.4	0.1
Delay (s)	100.0	161.9	48.0	249.0	75.0	46.8	148.7	183.5	22.7	165.3	163.6	20.0
Level of Service	F	F	D	F	E	D	F	F	C	F	F	C
Approach Delay (s)		128.6			163.5			149.2			149.5	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	148.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.28		
Actuated Cycle Length (s)	147.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	111.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	51	34	206	256	94	55	295	600	148	0	772	95
Future Volume (veh/h)	51	34	206	256	94	55	295	600	148	0	772	95
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	59	40	240	298	109	64	343	698	172	0	898	110
Adj No. of Lanes	1	1	1	1	1	1	1	2	1	1	2	1
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	76	260	553	326	523	444	372	1927	862	1	1030	461
Arrive On Green	0.04	0.14	0.14	0.19	0.28	0.28	0.21	0.55	0.55	0.00	0.29	0.29
Sat Flow, veh/h	1757	1845	1568	1757	1845	1568	1757	3505	1568	1757	3505	1568
Grp Volume(v), veh/h	59	40	240	298	109	64	343	698	172	0	898	110
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	1845	1568	1757	1752	1568	1757	1752	1568
Q Serve(g_s), s	4.0	2.3	14.0	19.9	5.4	3.7	22.9	13.4	6.6	0.0	29.2	6.4
Cycle Q Clear(g_c), s	4.0	2.3	14.0	19.9	5.4	3.7	22.9	13.4	6.6	0.0	29.2	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	76	260	553	326	523	444	372	1927	862	1	1030	461
V/C Ratio(X)	0.78	0.15	0.43	0.91	0.21	0.14	0.92	0.36	0.20	0.00	0.87	0.24
Avail Cap(c_a), veh/h	157	523	777	378	756	642	435	1936	866	73	1181	529
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	0.00	1.00	1.00
Uniform Delay (d), s/veh	56.8	45.2	29.6	47.8	32.7	32.1	46.3	15.2	13.6	0.0	40.2	32.1
Incr Delay (d2), s/veh	15.5	0.3	0.5	24.0	0.2	0.1	23.0	0.1	0.1	0.0	6.6	0.3
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	2.3	1.2	6.1	11.9	2.8	1.6	13.5	6.5	2.9	0.0	15.0	2.8
LnGrp Delay(d),s/veh	72.3	45.5	30.2	71.9	32.9	32.2	69.3	15.3	13.7	0.0	46.8	32.4
LnGrp LOS	E	D	C	E	C	C	E	B	B		D	C
Approach Vol, veh/h		339			471			1213			1008	
Approach Delay, s/veh		39.3			57.5			30.3			45.2	
Approach LOS		D			E			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	0.0	71.2	26.5	22.2	30.7	40.5	9.4	39.3
Change Period (Y+Rc), s	* 4.2	5.3	* 4.2	5.3	5.3	5.3	* 4.2	5.3
Max Green Setting (Gmax), s	* 5	66.2	* 26	34.0	29.7	40.4	* 11	49.1
Max Q Clear Time (g_c+I1), s	0.0	15.4	21.9	16.0	24.9	31.2	6.0	7.4
Green Ext Time (p_c), s	0.0	5.6	0.3	0.9	0.5	4.1	0.0	0.7

Intersection Summary	
HCM 2010 Ctrl Delay	40.5
HCM 2010 LOS	D

Notes

Intersection	
Intersection Delay, s/veh	10.4
Intersection LOS	B

Approach	WB	NB	SB
Entry Lanes	1	2	2
Conflicting Circle Lanes	2	2	2
Adj Approach Flow, veh/h	19	1116	1295
Demand Flow Rate, veh/h	20	1150	1333
Vehicles Circulating, veh/h	1129	16	18
Vehicles Exiting, veh/h	37	1335	1131
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	7.9	9.4	11.2
Approach LOS	A	A	B

Lane	Left	Left	Right	Left	Right
Designated Moves	LR	LT	TR	LT	TR
Assumed Moves	LR	LT	TR	LT	TR
RT Channelized					
Lane Util	1.000	0.470	0.530	0.470	0.530
Critical Headway, s	4.113	4.293	4.113	4.293	4.113
Entry Flow, veh/h	20	540	610	627	706
Cap Entry Lane, veh/h	513	1116	1117	1115	1116
Entry HV Adj Factor	0.950	0.971	0.970	0.970	0.972
Flow Entry, veh/h	19	525	592	608	686
Cap Entry, veh/h	487	1085	1084	1082	1084
V/C Ratio	0.039	0.484	0.546	0.562	0.633
Control Delay, s/veh	7.9	8.8	10.0	10.3	12.0
LOS	A	A	A	B	B
95th %tile Queue, veh	0	3	3	4	5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	141	168	35	591	497	3	38	912	149	30	1110	104
Future Volume (veh/h)	141	168	35	591	497	3	38	912	149	30	1110	104
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	145	173	36	609	512	3	39	940	154	31	1144	107
Adj No. of Lanes	1	1	1	2	1	1	1	2	1	1	2	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	172	387	329	648	557	473	62	1236	553	53	1219	545
Arrive On Green	0.10	0.21	0.21	0.19	0.30	0.30	0.04	0.35	0.35	0.03	0.35	0.35
Sat Flow, veh/h	1757	1845	1568	3408	1845	1568	1757	3505	1568	1757	3505	1568
Grp Volume(v), veh/h	145	173	36	609	512	3	39	940	154	31	1144	107
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1704	1845	1568	1757	1752	1568	1757	1752	1568
Q Serve(g_s), s	7.0	7.0	1.6	15.1	23.0	0.1	1.9	20.3	6.0	1.5	27.1	4.1
Cycle Q Clear(g_c), s	7.0	7.0	1.6	15.1	23.0	0.1	1.9	20.3	6.0	1.5	27.1	4.1
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	172	387	329	648	557	473	62	1236	553	53	1219	545
V/C Ratio(X)	0.84	0.45	0.11	0.94	0.92	0.01	0.63	0.76	0.28	0.58	0.94	0.20
Avail Cap(c_a), veh/h	172	431	366	648	601	511	103	1236	553	103	1231	551
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	38.0	29.5	27.4	34.2	28.9	20.9	40.8	24.5	19.9	41.0	27.0	19.6
Incr Delay (d2), s/veh	29.6	0.8	0.1	21.7	18.8	0.0	10.0	2.8	0.3	9.5	13.4	0.2
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	4.8	3.6	0.7	9.1	14.6	0.1	1.1	10.3	2.6	0.9	15.3	1.8
LnGrp Delay(d),s/veh	67.6	30.4	27.5	55.9	47.7	20.9	50.8	27.3	20.2	50.5	40.5	19.7
LnGrp LOS	E	C	C	E	D	C	D	C	C	D	D	B
Approach Vol, veh/h		354			1124			1133			1282	
Approach Delay, s/veh		45.3			52.1			27.2			39.0	
Approach LOS		D			D			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.8	35.5	20.5	22.9	7.2	35.1	12.6	30.8
Change Period (Y+Rc), s	* 4.2	5.3	* 4.2	4.9	* 4.2	5.3	* 4.2	4.9
Max Green Setting (Gmax), s	* 5	30.1	* 16	20.0	* 5	30.1	* 8.4	27.9
Max Q Clear Time (g_c+I1), s	3.5	22.3	17.1	9.0	3.9	29.1	9.0	25.0
Green Ext Time (p_c), s	0.0	3.8	0.0	0.7	0.0	0.7	0.0	0.9

Intersection Summary	
HCM 2010 Ctrl Delay	39.9
HCM 2010 LOS	D

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	112	74	282	92	33	37	281	840	241	60	808	94
Future Volume (veh/h)	112	74	282	92	33	37	281	840	241	60	808	94
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	122	80	307	100	36	40	305	913	262	65	878	102
Adj No. of Lanes	1	1	1	1	1	1	1	2	1	1	2	1
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, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	151	132	764	118	80	68	730	2277	1019	84	954	427
Arrive On Green	0.09	0.07	0.07	0.07	0.04	0.04	0.42	0.65	0.65	0.02	0.09	0.09
Sat Flow, veh/h	1757	1845	1568	1757	1845	1568	1757	3505	1568	1757	3505	1568
Grp Volume(v), veh/h	122	80	307	100	36	40	305	913	262	65	878	102
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	1845	1568	1757	1752	1568	1757	1752	1568
Q Serve(g_s), s	7.9	4.9	2.9	6.5	2.2	2.5	14.2	14.3	8.2	4.3	28.8	7.0
Cycle Q Clear(g_c), s	7.9	4.9	2.9	6.5	2.2	2.5	14.2	14.3	8.2	4.3	28.8	7.0
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	151	132	764	118	80	68	730	2277	1019	84	954	427
V/C Ratio(X)	0.81	0.61	0.40	0.85	0.45	0.59	0.42	0.40	0.26	0.78	0.92	0.24
Avail Cap(c_a), veh/h	151	561	1129	118	541	460	730	2277	1019	150	970	434
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
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	52.0	52.3	8.1	53.5	54.2	40.7	24.0	9.6	8.5	56.5	51.5	41.6
Incr Delay (d2), s/veh	26.3	4.4	0.3	40.3	4.0	8.0	0.4	0.5	0.6	14.1	15.3	1.3
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	4.9	2.7	3.8	4.5	1.2	1.2	6.9	7.0	3.6	2.4	16.1	3.2
LnGrp Delay(d),s/veh	78.3	56.7	8.4	93.8	58.1	48.7	24.3	10.2	9.2	70.6	66.8	42.9
LnGrp LOS	E	E	A	F	E	D	C	B	A	E	E	D
Approach Vol, veh/h		509			176			1480			1045	
Approach Delay, s/veh		32.7			76.3			12.9			64.7	
Approach LOS		C			E			B			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.7	80.7	12.0	13.6	53.5	36.9	15.3	10.3
Change Period (Y+Rc), s	* 4.2	5.3	* 4.2	5.3	5.3	* 5.3	5.3	* 5.3
Max Green Setting (Gmax), s	* 9.9	44.0	* 7.8	35.3	21.8	* 32	9.1	* 34
Max Q Clear Time (g_c+I1), s	6.3	16.3	8.5	6.9	16.2	30.8	9.9	4.5
Green Ext Time (p_c), s	0.0	7.6	0.0	1.4	0.4	0.7	0.0	0.2

Intersection Summary	
HCM 2010 Ctrl Delay	36.4
HCM 2010 LOS	D

Notes

Intersection	
Intersection Delay, s/veh	12.0
Intersection LOS	B

Approach	WB	NB	SB
Entry Lanes	1	2	2
Conflicting Circle Lanes	2	2	2
Adj Approach Flow, veh/h	29	1458	1260
Demand Flow Rate, veh/h	30	1502	1298
Vehicles Circulating, veh/h	1484	3	19
Vehicles Exiting, veh/h	21	1314	1495
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	10.4	13.1	10.9
Approach LOS	B	B	B

Lane	Left	Left	Right	Left	Right
Designated Moves	LR	LT	TR	LT	TR
Assumed Moves	LR	LT	TR	LT	TR
RT Channelized					
Lane Util	1.000	0.470	0.530	0.470	0.530
Critical Headway, s	4.113	4.293	4.113	4.293	4.113
Entry Flow, veh/h	30	706	796	610	688
Cap Entry Lane, veh/h	400	1127	1128	1114	1115
Entry HV Adj Factor	0.967	0.970	0.971	0.971	0.971
Flow Entry, veh/h	29	685	773	592	668
Cap Entry, veh/h	387	1094	1094	1082	1083
V/C Ratio	0.075	0.626	0.706	0.548	0.617
Control Delay, s/veh	10.4	11.8	14.3	10.0	11.6
LOS	B	B	B	B	B
95th %tile Queue, veh	0	5	6	3	4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	247	394	75	373	301	45	15	1096	296	16	1057	117
Future Volume (veh/h)	247	394	75	373	301	45	15	1096	296	16	1057	117
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	268	428	82	405	327	49	16	1191	322	17	1149	127
Adj No. of Lanes	1	1	1	2	1	1	1	2	1	1	2	1
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, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	303	471	401	471	408	347	33	1287	576	34	1291	577
Arrive On Green	0.17	0.26	0.26	0.14	0.22	0.22	0.02	0.37	0.37	0.02	0.37	0.37
Sat Flow, veh/h	1757	1845	1568	3408	1845	1568	1757	3505	1568	1757	3505	1568
Grp Volume(v), veh/h	268	428	82	405	327	49	16	1191	322	17	1149	127
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1704	1845	1568	1757	1752	1568	1757	1752	1568
Q Serve(g_s), s	12.6	19.1	3.5	9.8	14.2	2.1	0.8	27.6	13.8	0.8	26.1	4.7
Cycle Q Clear(g_c), s	12.6	19.1	3.5	9.8	14.2	2.1	0.8	27.6	13.8	0.8	26.1	4.7
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	303	471	401	471	408	347	33	1287	576	34	1291	577
V/C Ratio(X)	0.88	0.91	0.20	0.86	0.80	0.14	0.49	0.93	0.56	0.50	0.89	0.22
Avail Cap(c_a), veh/h	307	503	428	471	436	370	104	1308	585	104	1308	585
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	34.2	30.6	24.8	35.7	31.2	26.5	41.2	25.7	21.3	41.1	25.1	18.4
Incr Delay (d2), s/veh	24.7	19.6	0.2	14.9	9.8	0.2	11.0	11.2	1.2	10.7	7.9	0.2
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	8.2	12.2	1.5	5.6	8.4	0.9	0.5	15.2	6.1	0.5	14.0	2.1
LnGrp Delay(d),s/veh	58.9	50.2	25.0	50.6	41.0	26.7	52.2	36.8	22.5	51.9	33.0	18.6
LnGrp LOS	E	D	C	D	D	C	D	D	C	D	C	B
Approach Vol, veh/h		778			781			1529			1293	
Approach Delay, s/veh		50.5			45.1			34.0			31.9	
Approach LOS		D			D			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.8	36.4	15.9	26.5	5.8	36.5	18.8	23.6
Change Period (Y+Rc), s	* 4.2	5.3	* 4.2	4.9	* 4.2	5.3	* 4.2	4.9
Max Green Setting (Gmax), s	* 5	31.6	* 12	23.1	* 5	31.6	* 15	20.0
Max Q Clear Time (g_c+I1), s	2.8	29.6	11.8	21.1	2.8	28.1	14.6	16.2
Green Ext Time (p_c), s	0.0	1.5	0.0	0.6	0.0	2.3	0.0	0.7

Intersection Summary	
HCM 2010 Ctrl Delay	38.3
HCM 2010 LOS	D

Notes

Intersection: 1: Fowler Avenue & Clinton Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	UL	T	R	L	T	R
Maximum Queue (ft)	91	172	304	396	180	264	628	100	360	535	135
Average Queue (ft)	41	72	207	149	49	135	246	69	60	255	50
95th Queue (ft)	85	141	319	294	128	270	476	125	163	434	96
Link Distance (ft)		2643		1265			1232			2590	2590
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	150		225		105	175		40	255		
Storage Blk Time (%)		1	11	8		0	40	3		10	
Queuing Penalty (veh)		0	33	36		0	119	17		5	

Intersection: 3: Fowler Avenue & McKinley Avenue

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	T	T
Maximum Queue (ft)	109	87	232	356	228	63	350	253	211	108	302	309
Average Queue (ft)	42	28	63	176	53	21	185	125	92	29	161	177
95th Queue (ft)	89	66	142	276	129	44	296	225	202	70	248	272
Link Distance (ft)		4012			2552			1282	1282		1203	1203
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250		250	250		250	250			250		
Storage Blk Time (%)			0	3			4	0			1	2
Queuing Penalty (veh)			0	4			13	0			0	1

Intersection: 3: Fowler Avenue & McKinley Avenue

Movement	SB
Directions Served	R
Maximum Queue (ft)	61
Average Queue (ft)	22
95th Queue (ft)	50
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: Fowler Avenue & Floradora Avenue

Movement	WB	NB	NB	SB
Directions Served	LR	T	TR	LT
Maximum Queue (ft)	27	165	31	76
Average Queue (ft)	4	35	1	20
95th Queue (ft)	19	91	10	59
Link Distance (ft)	1204	1209	1209	1282
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Fowler Avenue & Olive Avenue

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	L	L	T	R	L	T	T	R	L
Maximum Queue (ft)	178	176	61	250	300	663	19	48	260	278	101	113
Average Queue (ft)	107	86	13	188	224	296	1	27	179	168	30	36
95th Queue (ft)	170	158	41	274	331	545	8	54	256	248	62	78
Link Distance (ft)		2633				2558			2530	2530		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	185		250	200	200		250	250			250	250
Storage Blk Time (%)	0	0		8	14	17			1	0		
Queuing Penalty (veh)	0	0		38	70	99			0	1		

Intersection: 5: Fowler Avenue & Olive Avenue

Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	370	365	370
Average Queue (ft)	219	230	38
95th Queue (ft)	329	332	144
Link Distance (ft)	1209	1209	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			250
Storage Blk Time (%)	4	5	
Queuing Penalty (veh)	1	5	

Network Summary

Network wide Queuing Penalty: 445

Intersection: 1: Fowler Avenue & Clinton Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	B6	SB	SB	SB
Directions Served	L	TR	L	T	R	UL	T	R	T	L	T	R
Maximum Queue (ft)	250	366	302	341	73	264	1334	100	580	156	355	66
Average Queue (ft)	89	147	169	95	33	93	1153	82	169	84	202	20
95th Queue (ft)	162	254	266	206	60	238	1577	140	479	148	311	49
Link Distance (ft)		2641		1266			1232		1203		2626	2626
Upstream Blk Time (%)							33					
Queuing Penalty (veh)							323					
Storage Bay Dist (ft)	150		225		105	175		40		255		
Storage Blk Time (%)	1	10	5	7			53	8			4	
Queuing Penalty (veh)	2	14	9	19			190	58			4	

Intersection: 3: Fowler Avenue & McKinley Avenue

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	133	104	169	113	90	42	279	322	272	110	132	257
Average Queue (ft)	68	49	79	65	25	11	173	182	114	38	50	163
95th Queue (ft)	118	93	147	116	67	29	273	299	239	79	104	236
Link Distance (ft)		3965			2552			1283	1283			1203
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250		250	250		250	250			250	250	
Storage Blk Time (%)							3	3	0			0
Queuing Penalty (veh)							11	7	1			0

Intersection: 3: Fowler Avenue & McKinley Avenue

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	316	84
Average Queue (ft)	182	25
95th Queue (ft)	266	57
Link Distance (ft)	1203	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		250
Storage Blk Time (%)	1	
Queuing Penalty (veh)	1	

Intersection: 4: Fowler Avenue & Floradora Avenue

Movement	WB	NB	SB
Directions Served	LR	T	LT
Maximum Queue (ft)	52	83	103
Average Queue (ft)	9	32	17
95th Queue (ft)	33	73	59
Link Distance (ft)	1204	1209	1283
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Fowler Avenue & Olive Avenue

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	L	L	T	R	L	T	T	R	L
Maximum Queue (ft)	304	364	105	211	225	216	66	68	339	314	159	27
Average Queue (ft)	183	210	34	95	113	128	12	17	186	188	74	8
95th Queue (ft)	289	339	75	158	166	211	35	46	282	284	134	26
Link Distance (ft)		2633				2558			2530	2530		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	185		250	200	200		250	250			250	250
Storage Blk Time (%)	9	14		0	1	1			1	1		
Queuing Penalty (veh)	42	45		0	2	5			0	4		

Intersection: 5: Fowler Avenue & Olive Avenue

Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	266	301	66
Average Queue (ft)	184	200	28
95th Queue (ft)	271	286	57
Link Distance (ft)	1209	1209	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			250
Storage Blk Time (%)	1	2	
Queuing Penalty (veh)	0	2	

Network Summary

Network wide Queuing Penalty: 738

Appendix I: Cumulative Year 2035 plus Project Traffic Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	49	89	41	358	202	96	45	101	598	199	48	760
Future Volume (vph)	49	89	41	358	202	96	45	101	598	199	48	760
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.95		1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1752	1757		1752	1845	1568		1752	1845	1568	1752	1845
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1752	1757		1752	1845	1568		1752	1845	1568	1752	1845
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	56	101	47	407	230	109	51	115	680	226	55	864
RTOR Reduction (vph)	0	12	0	0	0	77	0	0	0	56	0	0
Lane Group Flow (vph)	56	136	0	407	230	32	0	166	680	170	55	864
Confl. Peds. (#/hr)								3				
Turn Type	Prot	NA		Prot	NA	Perm	Prot	Prot	NA	Perm	Prot	NA
Protected Phases	7	4		3	8		5	5	2		1	6
Permitted Phases						8				2		
Actuated Green, G (s)	7.6	18.3		27.9	38.6	38.6		11.8	64.7	64.7	5.7	58.6
Effective Green, g (s)	7.6	18.3		27.9	38.6	38.6		11.8	64.7	64.7	5.7	58.6
Actuated g/C Ratio	0.06	0.13		0.21	0.28	0.28		0.09	0.48	0.48	0.04	0.43
Clearance Time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	98	237		360	525	446		152	880	748	73	797
v/s Ratio Prot	0.03	c0.08		c0.23	0.12			c0.09	0.37		0.03	c0.47
v/s Ratio Perm						0.02				0.11		
v/c Ratio	0.57	0.57		1.13	0.44	0.07		1.09	0.77	0.23	0.75	1.08
Uniform Delay, d1	62.4	55.0		53.9	39.6	35.4		61.9	29.4	20.8	64.3	38.5
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.8	3.3		87.7	0.6	0.1		99.8	4.3	0.2	35.0	57.1
Delay (s)	70.2	58.3		141.6	40.2	35.5		161.7	33.6	20.9	99.2	95.6
Level of Service	E	E		F	D	D		F	C	C	F	F
Approach Delay (s)		61.6			94.8				50.8			80.2
Approach LOS		E			F				D			F

Intersection Summary			
HCM 2000 Control Delay	72.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	135.6	Sum of lost time (s)	19.0
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	229
Future Volume (vph)	229
Ideal Flow (vphpl)	1900
Total Lost time (s)	5.3
Lane Util. Factor	1.00
Frpb, ped/bikes	1.00
Flpb, ped/bikes	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1568
Flt Permitted	1.00
Satd. Flow (perm)	1568
Peak-hour factor, PHF	0.88
Adj. Flow (vph)	260
RTOR Reduction (vph)	79
Lane Group Flow (vph)	181
Confl. Peds. (#/hr)	
Turn Type	Perm
Protected Phases	
Permitted Phases	6
Actuated Green, G (s)	58.6
Effective Green, g (s)	58.6
Actuated g/C Ratio	0.43
Clearance Time (s)	5.3
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	677
v/s Ratio Prot	
v/s Ratio Perm	0.12
v/c Ratio	0.27
Uniform Delay, d1	24.7
Progression Factor	1.00
Incremental Delay, d2	0.2
Delay (s)	24.9
Level of Service	C
Approach Delay (s)	
Approach LOS	

Intersection Summary

Intersection	
Int Delay, s/veh	2.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	161	749	29	113	947
Future Vol, veh/h	0	161	749	29	113	947
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	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	0	183	851	33	128	1076

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	868	0	0	884	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.23	-	-	4.13	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.327	-	-	2.227	-
Pot Cap-1 Maneuver	0	350	-	-	761	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	350	-	-	761	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	26	0	1.1
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	350	761	-
HCM Lane V/C Ratio	-	-	0.523	0.169	-
HCM Control Delay (s)	-	-	26	10.7	-
HCM Lane LOS	-	-	D	B	-
HCM 95th %tile Q(veh)	-	-	2.9	0.6	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	51	34	206	333	96	82	295	620	169	99	783	95
Future Vol, veh/h	51	34	206	333	96	82	295	620	169	99	783	95
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	250	-	-	250	-	-	250	-	-	250	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	58	39	234	378	109	93	335	705	192	113	890	108

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2742	2737	944	2778	2695	801	998	0	0	897	0	0
Stage 1	1170	1170	-	1471	1471	-	-	-	-	-	-	-
Stage 2	1572	1567	-	1307	1224	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.13	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	~ 13	~ 20	317	~ 12	~ 21	383	689	-	-	753	-	-
Stage 1	234	266	-	~ 157	190	-	-	-	-	-	-	-
Stage 2	138	171	-	~ 195	250	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	~ 9	317	-	~ 9	383	689	-	-	753	-	-
Mov Cap-2 Maneuver	-	~ 9	-	-	~ 9	-	-	-	-	-	-	-
Stage 1	120	226	-	~ 81	~ 98	-	-	-	-	-	-	-
Stage 2	-	88	-	~ 36	213	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			4.1	1.1
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	689	-	-	-	54	-	16	753	-	-
HCM Lane V/C Ratio	0.487	-	-	-	5.051	-	12.642	0.149	-	-
HCM Control Delay (s)	15.1	-	-	-	$ 1974	-	$ 5702.8	10.6	-	-
HCM Lane LOS	C	-	-	-	F	-	F	B	-	-
HCM 95th %tile Q(veh)	2.7	-	-	-	30.7	-	26.2	0.5	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Intersection Delay, s/veh	335.5
Intersection LOS	F

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	16	3	1092	19	15	1316
Future Vol, veh/h	16	3	1092	19	15	1316
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	17	3	1138	20	16	1371
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	12	264.4	399.5
HCM LOS	B	F	F

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	84%	1%
Vol Thru, %	98%	0%	99%
Vol Right, %	2%	16%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	1111	19	1331
LT Vol	0	16	15
Through Vol	1092	0	1316
RT Vol	19	3	0
Lane Flow Rate	1157	20	1386
Geometry Grp	1	1	1
Degree of Util (X)	1.535	0.039	1.844
Departure Headway (Hd)	5.584	8.695	5.334
Convergence, Y/N	Yes	Yes	Yes
Cap	660	414	693
Service Time	3.584	6.695	3.334
HCM Lane V/C Ratio	1.753	0.048	2
HCM Control Delay	264.4	12	399.5
HCM Lane LOS	F	B	F
HCM 95th-tile Q	50.5	0.1	77.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	141	168	35	591	497	3	38	952	149	35	1187	110
Future Volume (vph)	141	168	35	591	497	3	38	952	149	35	1187	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	4.9	4.9	4.2	4.9	4.9	4.2	5.3	5.3	4.2	5.3	5.3
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	1845	1568	1752	1845	1568	1752	1845	1568	1752	1845	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1752	1845	1568	1752	1845	1568	1752	1845	1568	1752	1845	1568
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	145	173	36	609	512	3	39	981	154	36	1224	113
RTOR Reduction (vph)	0	0	31	0	0	2	0	0	55	0	0	55
Lane Group Flow (vph)	145	173	5	609	512	1	39	981	99	36	1224	58
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	12.8	19.1	19.1	35.9	42.2	42.2	3.9	70.7	70.7	3.9	70.7	70.7
Effective Green, g (s)	12.8	19.1	19.1	35.9	42.2	42.2	3.9	70.7	70.7	3.9	70.7	70.7
Actuated g/C Ratio	0.09	0.13	0.13	0.24	0.28	0.28	0.03	0.48	0.48	0.03	0.48	0.48
Clearance Time (s)	4.2	4.9	4.9	4.2	4.9	4.9	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	151	237	202	424	525	446	46	880	748	46	880	748
v/s Ratio Prot	0.08	0.09		c0.35	c0.28		c0.02	0.53		0.02	c0.66	
v/s Ratio Perm			0.00			0.00			0.06			0.04
v/c Ratio	0.96	0.73	0.02	1.44	0.98	0.00	0.85	1.11	0.13	0.78	1.39	0.08
Uniform Delay, d1	67.4	62.1	56.4	56.1	52.5	37.9	71.9	38.7	21.6	71.7	38.7	21.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	61.1	10.7	0.0	209.4	32.7	0.0	76.6	67.0	0.1	57.8	182.9	0.0
Delay (s)	128.5	72.8	56.4	265.6	85.2	37.9	148.4	105.7	21.7	129.5	221.7	21.1
Level of Service	F	E	E	F	F	D	F	F	C	F	F	C
Approach Delay (s)		94.0			182.8			96.1			202.7	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	156.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.34		
Actuated Cycle Length (s)	148.2	Sum of lost time (s)	18.6
Intersection Capacity Utilization	116.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	137	206	76	211	101	62	20	37	676	318	96	641
Future Volume (vph)	137	206	76	211	101	62	20	37	676	318	96	641
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1752	1770		1752	1845	1568		1752	1845	1568	1752	1845
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1752	1770		1752	1845	1568		1752	1845	1568	1752	1845
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	152	229	84	234	112	69	22	41	751	353	107	712
RTOR Reduction (vph)	0	11	0	0	0	60	0	0	0	77	0	0
Lane Group Flow (vph)	152	302	0	234	112	9	0	63	751	276	107	712
Turn Type	Prot	NA		Prot	NA	Perm	Prot	Prot	NA	Perm	Prot	NA
Protected Phases	7	4		3	8		5	5	2		1	6
Permitted Phases						8				2		
Actuated Green, G (s)	27.1	25.4		17.5	15.8	15.8		10.3	52.1	52.1	8.6	50.4
Effective Green, g (s)	27.1	25.4		17.5	15.8	15.8		10.3	52.1	52.1	8.6	50.4
Actuated g/C Ratio	0.22	0.21		0.14	0.13	0.13		0.08	0.42	0.42	0.07	0.41
Clearance Time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	387	366		250	237	202		147	784	666	122	758
v/s Ratio Prot	0.09	c0.17		c0.13	0.06			0.04	c0.41		c0.06	0.39
v/s Ratio Perm						0.01				0.18		
v/c Ratio	0.39	0.82		0.94	0.47	0.04		0.43	0.96	0.41	0.88	0.94
Uniform Delay, d1	40.7	46.5		52.0	49.5	46.8		53.4	34.2	24.6	56.5	34.6
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	14.0		39.5	1.5	0.1		2.0	22.2	0.4	45.7	19.2
Delay (s)	41.4	60.5		91.5	51.0	46.9		55.4	56.3	25.0	102.1	53.8
Level of Service	D	E		F	D	D		E	E	C	F	D
Approach Delay (s)		54.2			73.1				46.8			56.5
Approach LOS		D			E				D			E

Intersection Summary			
HCM 2000 Control Delay	54.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	122.6	Sum of lost time (s)	19.0
Intersection Capacity Utilization	83.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	77
Future Volume (vph)	77
Ideal Flow (vphpl)	1900
Total Lost time (s)	5.3
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1568
Flt Permitted	1.00
Satd. Flow (perm)	1568
Peak-hour factor, PHF	0.90
Adj. Flow (vph)	86
RTOR Reduction (vph)	51
Lane Group Flow (vph)	35
Turn Type	Perm
Protected Phases	
Permitted Phases	6
Actuated Green, G (s)	50.4
Effective Green, g (s)	50.4
Actuated g/C Ratio	0.41
Clearance Time (s)	5.3
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	644
v/s Ratio Prot	
v/s Ratio Perm	0.02
v/c Ratio	0.05
Uniform Delay, d1	21.8
Progression Factor	1.00
Incremental Delay, d2	0.0
Delay (s)	21.8
Level of Service	C
Approach Delay (s)	
Approach LOS	

Intersection Summary

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	55	968	42	44	956
Future Vol, veh/h	0	55	968	42	44	956
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	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	0	61	1076	47	49	1062

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	1100	0	0	1123	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.23	-	-	4.13	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.327	-	-	2.227	-
Pot Cap-1 Maneuver	0	257	-	-	618	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	257	-	-	618	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	23.3	0	0.5
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	257	618	-
HCM Lane V/C Ratio	-	-	0.238	0.079	-
HCM Control Delay (s)	-	-	23.3	11.3	-
HCM Lane LOS	-	-	C	B	-
HCM 95th %tile Q(veh)	-	-	0.9	0.3	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	112	74	282	113	34	45	281	845	246	82	811	94
Future Vol, veh/h	112	74	282	113	34	45	281	845	246	82	811	94
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	250	-	-	250	-	-	250	-	-	250	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	124	82	313	126	38	50	312	939	273	91	901	104

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2879	2971	953	3033	2887	1076	1005	0	0	1212	0	0
Stage 1	1135	1135	-	1700	1700	-	-	-	-	-	-	-
Stage 2	1744	1836	-	1333	1187	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.13	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	~ 10	~ 14	~ 313	~ 8	~ 16	265	685	-	-	572	-	-
Stage 1	245	276	-	~ 116	147	-	-	-	-	-	-	-
Stage 2	~ 109	125	-	189	261	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	~ 6	~ 313	-	~ 7	265	685	-	-	572	-	-
Mov Cap-2 Maneuver	-	~ 6	-	-	~ 7	-	-	-	-	-	-	-
Stage 1	134	232	-	~ 63	80	-	-	-	-	-	-	-
Stage 2	~ 25	~ 68	-	-	220	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			3	1
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	685	-	-	-	27	-	16	572	-	-
HCM Lane V/C Ratio	0.456	-	-	-	14.65	-	5.486	0.159	-	-
HCM Control Delay (s)	14.6	-	-	-	$ 6420.8	-	$ 2494.1	12.5	-	-
HCM Lane LOS	B	-	-	-	F	-	F	B	-	-
HCM 95th %tile Q(veh)	2.4	-	-	-	49.1	-	11.8	0.6	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Intersection Delay, s/veh	396.1
Intersection LOS	F

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	17	11	1378	16	3	1218
Future Vol, veh/h	17	11	1378	16	3	1218
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	18	12	1451	17	3	1282
Number of Lanes	1	0	1	0	0	1
Approach	**WB**		**NB**		**SB**	
Opposing Approach			SB		NB	
Opposing Lanes	0		1		1	
Conflicting Approach Left	NB				WB	
Conflicting Lanes Left	1		0		1	
Conflicting Approach Right	SB		WB			
Conflicting Lanes Right	1		1		0	
HCM Control Delay	12.2		449.7		343.7	
HCM LOS	B		F		F	

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	61%	0%
Vol Thru, %	99%	0%	100%
Vol Right, %	1%	39%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	1394	28	1221
LT Vol	0	17	3
Through Vol	1378	0	1218
RT Vol	16	11	0
Lane Flow Rate	1467	29	1285
Geometry Grp	1	1	1
Degree of Util (X)	1.956	0.057	1.715
Departure Headway (Hd)	5.526	8.709	5.74
Convergence, Y/N	Yes	Yes	Yes
Cap	675	414	643
Service Time	3.526	6.709	3.74
HCM Lane V/C Ratio	2.173	0.07	1.998
HCM Control Delay	449.7	12.2	343.7
HCM Lane LOS	F	B	F
HCM 95th-tile Q	83.6	0.2	62.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	247	394	75	373	301	45	15	1105	296	17	1078	119
Future Volume (vph)	247	394	75	373	301	45	15	1105	296	17	1078	119
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	4.9	4.9	4.2	4.9	4.9	4.2	5.3	5.3	4.2	5.3	5.3
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	1845	1568	1752	1845	1568	1752	1845	1568	1752	1845	1568
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1752	1845	1568	1752	1845	1568	1752	1845	1568	1752	1845	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	268	428	82	405	327	49	16	1201	322	18	1172	129
RTOR Reduction (vph)	0	0	63	0	0	39	0	0	69	0	0	38
Lane Group Flow (vph)	268	428	19	405	327	10	16	1201	253	18	1172	91
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	23.8	29.1	29.1	24.8	30.1	30.1	2.0	73.5	73.5	2.9	74.4	74.4
Effective Green, g (s)	23.8	29.1	29.1	24.8	30.1	30.1	2.0	73.5	73.5	2.9	74.4	74.4
Actuated g/C Ratio	0.16	0.20	0.20	0.17	0.20	0.20	0.01	0.49	0.49	0.02	0.50	0.50
Clearance Time (s)	4.2	4.9	4.9	4.2	4.9	4.9	4.2	5.3	5.3	4.2	5.3	5.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	280	360	306	291	372	316	23	910	773	34	921	783
v/s Ratio Prot	0.15	c0.23		c0.23	0.18		0.01	c0.65		c0.01	0.64	
v/s Ratio Perm			0.01			0.01			0.16			0.06
v/c Ratio	0.96	1.19	0.06	1.39	0.88	0.03	0.70	1.32	0.33	0.53	1.27	0.12
Uniform Delay, d1	62.0	59.9	48.8	62.1	57.6	47.7	73.1	37.7	22.8	72.3	37.2	19.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	41.7	109.4	0.1	196.0	20.3	0.0	63.9	151.6	0.2	14.1	131.2	0.1
Delay (s)	103.8	169.3	48.9	258.1	77.9	47.7	137.1	189.3	23.0	86.4	168.4	19.9
Level of Service	F	F	D	F	E	D	F	F	C	F	F	B
Approach Delay (s)		134.1			169.5			154.0			152.8	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	152.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.28		
Actuated Cycle Length (s)	148.9	Sum of lost time (s)	18.6
Intersection Capacity Utilization	111.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	49	89	41	358	202	96	45	101	598	199	48	760
Future Volume (vph)	49	89	41	358	202	96	45	101	598	199	48	760
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.95		1.00	1.00	0.85		1.00	1.00	0.85	1.00	0.97
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1752	1757		1752	1845	1568		1752	3505	1568	1752	3383
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1752	1757		1752	1845	1568		1752	3505	1568	1752	3383
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	56	101	47	407	230	109	51	115	680	226	55	864
RTOR Reduction (vph)	0	12	0	0	0	72	0	0	0	132	0	18
Lane Group Flow (vph)	56	136	0	407	230	37	0	166	680	94	55	1106
Turn Type	Prot	NA		Prot	NA	Perm	Prot	Prot	NA	Perm	Prot	NA
Protected Phases	7	4		3	8		5	5	2		1	6
Permitted Phases						8				2		
Actuated Green, G (s)	7.6	17.4		36.0	45.8	45.8		15.9	56.6	56.6	7.5	48.2
Effective Green, g (s)	7.6	17.4		36.0	45.8	45.8		15.9	56.6	56.6	7.5	48.2
Actuated g/C Ratio	0.06	0.13		0.26	0.34	0.34		0.12	0.41	0.41	0.05	0.35
Clearance Time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	97	223		462	619	526		204	1453	650	96	1194
v/s Ratio Prot	0.03	c0.08		c0.23	0.12			c0.09	0.19		0.03	c0.33
v/s Ratio Perm						0.02				0.06		
v/c Ratio	0.58	0.61		0.88	0.37	0.07		0.81	0.47	0.14	0.57	0.93
Uniform Delay, d1	62.9	56.3		48.2	34.4	30.9		58.9	29.0	24.9	62.9	42.4
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.1	4.7		17.5	0.4	0.1		21.4	0.2	0.1	8.0	12.1
Delay (s)	71.0	61.0		65.7	34.8	30.9		80.2	29.3	25.0	71.0	54.5
Level of Service	E	E		E	C	C		F	C	C	E	D
Approach Delay (s)		63.7			51.1				36.2			55.3
Approach LOS		E			D				D			E

Intersection Summary			
HCM 2000 Control Delay	48.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	136.5	Sum of lost time (s)	19.0
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	229
Future Volume (vph)	229
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.88
Adj. Flow (vph)	260
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	161	749	29	113	947
Future Vol, veh/h	0	161	749	29	113	947
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	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	0	183	851	33	128	1076

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	442	0	0	884	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.96	-	-	4.16	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.33	-	-	2.23	-
Pot Cap-1 Maneuver	0	560	-	-	755	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	560	-	-	755	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.5	0	1.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	560	755	-
HCM Lane V/C Ratio	-	-	0.327	0.17	-
HCM Control Delay (s)	-	-	14.5	10.7	-
HCM Lane LOS	-	-	B	B	-
HCM 95th %tile Q(veh)	-	-	1.4	0.6	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	51	34	206	333	96	82	295	620	169	99	783	95
Future Volume (veh/h)	51	34	206	333	96	82	295	620	169	99	783	95
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	58	39	234	378	109	93	335	705	192	112	890	108
Adj No. of Lanes	1	1	1	1	1	1	1	2	1	1	2	1
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	74	254	537	403	599	509	360	1423	637	137	979	438
Arrive On Green	0.04	0.14	0.14	0.23	0.32	0.32	0.20	0.41	0.41	0.08	0.28	0.28
Sat Flow, veh/h	1757	1845	1568	1757	1845	1568	1757	3505	1568	1757	3505	1568
Grp Volume(v), veh/h	58	39	234	378	109	93	335	705	192	112	890	108
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	1845	1568	1757	1752	1568	1757	1752	1568
Q Serve(g_s), s	4.2	2.4	14.7	27.0	5.4	5.4	23.9	19.1	10.6	8.0	31.3	6.8
Cycle Q Clear(g_c), s	4.2	2.4	14.7	27.0	5.4	5.4	23.9	19.1	10.6	8.0	31.3	6.8
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	74	254	537	403	599	509	360	1423	637	137	979	438
V/C Ratio(X)	0.78	0.15	0.44	0.94	0.18	0.18	0.93	0.50	0.30	0.82	0.91	0.25
Avail Cap(c_a), veh/h	146	491	739	429	789	670	385	1423	637	246	1037	464
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	60.6	48.5	32.4	48.3	30.9	31.0	49.9	28.2	25.7	58.0	44.5	35.6
Incr Delay (d2), s/veh	15.8	0.3	0.6	27.8	0.1	0.2	28.2	0.3	0.3	11.2	11.2	0.3
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	2.4	1.2	6.4	16.2	2.8	2.4	14.4	9.3	4.6	4.3	16.7	3.0
LnGrp Delay(d),s/veh	76.4	48.8	33.0	76.1	31.1	31.1	78.1	28.5	25.9	69.1	55.7	35.9
LnGrp LOS	E	D	C	E	C	C	E	C	C	E	E	D
Approach Vol, veh/h		331			580			1232			1110	
Approach Delay, s/veh		42.4			60.4			41.6			55.1	
Approach LOS		D			E			D			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.2	57.2	33.5	22.9	30.4	41.0	9.6	46.8
Change Period (Y+Rc), s	* 4.2	5.3	* 4.2	5.3	* 4.2	5.3	* 4.2	5.3
Max Green Setting (Gmax), s	* 18	47.9	* 31	34.0	* 28	37.8	* 11	54.6
Max Q Clear Time (g_c+I1), s	10.0	21.1	29.0	16.7	25.9	33.3	6.2	7.4
Green Ext Time (p_c), s	0.1	5.4	0.3	0.9	0.2	2.3	0.0	0.9

Intersection Summary	
HCM 2010 Ctrl Delay	49.6
HCM 2010 LOS	D

Notes

Intersection	
Intersection Delay, s/veh	11.2
Intersection LOS	B

Approach	WB	NB	SB
Entry Lanes	1	2	2
Conflicting Circle Lanes	2	2	2
Adj Approach Flow, veh/h	20	1158	1387
Demand Flow Rate, veh/h	21	1193	1428
Vehicles Circulating, veh/h	1172	16	18
Vehicles Exiting, veh/h	37	1430	1175
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	8.1	9.8	12.4
Approach LOS	A	A	B

Lane	Left	Left	Right	Left	Right
Designated Moves	LR	LT	TR	LT	TR
Assumed Moves	LR	LT	TR	LT	TR
RT Channelized					
Lane Util	1.000	0.470	0.530	0.470	0.530
Critical Headway, s	4.113	4.293	4.113	4.293	4.113
Entry Flow, veh/h	21	561	632	671	757
Cap Entry Lane, veh/h	497	1116	1117	1115	1116
Entry HV Adj Factor	0.952	0.970	0.971	0.971	0.971
Flow Entry, veh/h	20	544	614	652	735
Cap Entry, veh/h	474	1083	1085	1083	1083
V/C Ratio	0.042	0.502	0.566	0.602	0.678
Control Delay, s/veh	8.1	9.1	10.4	11.2	13.4
LOS	A	A	B	B	B
95th %tile Queue, veh	0	3	4	4	6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	141	168	35	591	497	3	38	952	149	35	1187	110
Future Volume (veh/h)	141	168	35	591	497	3	38	952	149	35	1187	110
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	145	173	36	609	512	3	39	981	154	36	1224	113
Adj No. of Lanes	1	1	1	2	1	1	1	2	1	1	2	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	170	395	336	622	553	470	62	1244	557	59	1239	554
Arrive On Green	0.10	0.21	0.21	0.18	0.30	0.30	0.04	0.36	0.36	0.03	0.35	0.35
Sat Flow, veh/h	1757	1845	1568	3408	1845	1568	1757	3505	1568	1757	3505	1568
Grp Volume(v), veh/h	145	173	36	609	512	3	39	981	154	36	1224	113
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1704	1845	1568	1757	1752	1568	1757	1752	1568
Q Serve(g_s), s	7.0	7.0	1.6	15.4	23.3	0.1	1.9	21.7	6.1	1.8	30.0	4.3
Cycle Q Clear(g_c), s	7.0	7.0	1.6	15.4	23.3	0.1	1.9	21.7	6.1	1.8	30.0	4.3
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	170	395	336	622	553	470	62	1244	557	59	1239	554
V/C Ratio(X)	0.85	0.44	0.11	0.98	0.93	0.01	0.63	0.79	0.28	0.61	0.99	0.20
Avail Cap(c_a), veh/h	170	426	362	622	584	496	101	1244	557	101	1239	554
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	38.5	29.5	27.4	35.2	29.4	21.3	41.2	25.0	20.0	41.3	27.8	19.5
Incr Delay (d2), s/veh	31.4	0.8	0.1	30.8	20.4	0.0	10.2	3.5	0.3	9.9	22.7	0.2
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	4.9	3.7	0.7	9.8	14.9	0.1	1.1	11.1	2.6	1.0	18.4	1.9
LnGrp Delay(d),s/veh	69.9	30.3	27.5	66.0	49.8	21.3	51.4	28.5	20.2	51.2	50.5	19.7
LnGrp LOS	E	C	C	E	D	C	D	C	C	D	D	B
Approach Vol, veh/h		354			1124			1174			1373	
Approach Delay, s/veh		46.2			58.5			28.2			48.0	
Approach LOS		D			E			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.1	36.0	20.0	23.5	7.2	35.9	12.6	30.9
Change Period (Y+Rc), s	* 4.2	5.3	* 4.2	4.9	* 4.2	5.3	* 4.2	4.9
Max Green Setting (Gmax), s	* 5	30.6	* 16	20.0	* 5	30.6	* 8.4	27.4
Max Q Clear Time (g_c+I1), s	3.8	23.7	17.4	9.0	3.9	32.0	9.0	25.3
Green Ext Time (p_c), s	0.0	3.7	0.0	0.7	0.0	0.0	0.0	0.7

Intersection Summary	
HCM 2010 Ctrl Delay	45.0
HCM 2010 LOS	D

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	137	206	76	211	101	62	20	37	676	318	96	641
Future Volume (vph)	137	206	76	211	101	62	20	37	676	318	96	641
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.96		1.00	1.00	0.85		1.00	1.00	0.85	1.00	0.98
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1752	1770		1752	1845	1568		1752	3505	1568	1752	3448
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1752	1770		1752	1845	1568		1752	3505	1568	1752	3448
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	152	229	84	234	112	69	22	41	751	353	107	712
RTOR Reduction (vph)	0	13	0	0	0	59	0	0	0	232	0	7
Lane Group Flow (vph)	152	300	0	234	112	10	0	63	751	121	107	791
Turn Type	Prot	NA		Prot	NA	Perm	Prot	Prot	NA	Perm	Prot	NA
Protected Phases	7	4		3	8		5	5	2		1	6
Permitted Phases						8				2		
Actuated Green, G (s)	27.3	24.1		18.7	15.5	15.5		6.6	37.7	37.7	10.5	41.6
Effective Green, g (s)	27.3	24.1		18.7	15.5	15.5		6.6	37.7	37.7	10.5	41.6
Actuated g/C Ratio	0.25	0.22		0.17	0.14	0.14		0.06	0.34	0.34	0.10	0.38
Clearance Time (s)	4.2	5.3		4.2	5.3	5.3		4.2	5.3	5.3	4.2	5.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	434	387		297	259	220		105	1201	537	167	1303
v/s Ratio Prot	0.09	c0.17		c0.13	0.06			0.04	c0.21		0.06	c0.23
v/s Ratio Perm						0.01				0.08		
v/c Ratio	0.35	0.77		0.79	0.43	0.04		0.60	0.63	0.23	0.64	0.61
Uniform Delay, d1	34.0	40.4		43.7	43.2	40.8		50.4	30.2	25.7	47.9	27.6
Progression Factor	1.00	1.00		1.00	1.00	1.00		0.87	0.58	0.87	1.00	1.00
Incremental Delay, d2	0.5	9.3		12.9	1.2	0.1		8.1	2.2	0.9	8.1	2.1
Delay (s)	34.5	49.7		56.7	44.4	40.9		52.1	19.7	23.3	56.1	29.7
Level of Service	C	D		E	D	D		D	B	C	E	C
Approach Delay (s)		44.8			50.7				22.5			32.8
Approach LOS		D			D				C			C

Intersection Summary			
HCM 2000 Control Delay	33.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	67.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	77
Future Volume (vph)	77
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.90
Adj. Flow (vph)	86
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Intersection	
Int Delay, s/veh	0.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	55	968	42	44	956
Future Vol, veh/h	0	55	968	42	44	956
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	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	0	61	1076	47	49	1062

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	562	0	0	1123	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.96	-	-	4.16	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.33	-	-	2.23	-
Pot Cap-1 Maneuver	0	468	-	-	612	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	468	-	-	612	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.8	0	0.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	468	612	-
HCM Lane V/C Ratio	-	-	0.131	0.08	-
HCM Control Delay (s)	-	-	13.8	11.4	-
HCM Lane LOS	-	-	B	B	-
HCM 95th %tile Q(veh)	-	-	0.4	0.3	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	112	74	282	113	34	45	281	845	246	82	811	94
Future Volume (veh/h)	112	74	282	113	34	45	281	845	246	82	811	94
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	124	82	313	126	38	50	312	939	273	91	901	104
Adj No. of Lanes	1	1	1	1	1	1	1	2	1	1	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	166	137	751	136	87	74	711	2140	957	114	914	409
Arrive On Green	0.09	0.07	0.07	0.08	0.05	0.05	0.40	0.61	0.61	0.07	0.26	0.26
Sat Flow, veh/h	1757	1845	1568	1757	1845	1568	1757	3505	1568	1757	3505	1568
Grp Volume(v), veh/h	124	82	313	126	38	50	312	939	273	91	901	104
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1757	1845	1568	1757	1752	1568	1757	1752	1568
Q Serve(g_s), s	7.6	4.7	3.2	7.8	2.2	2.9	14.1	15.7	9.0	5.6	28.1	5.8
Cycle Q Clear(g_c), s	7.6	4.7	3.2	7.8	2.2	2.9	14.1	15.7	9.0	5.6	28.1	5.8
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	166	137	751	136	87	74	711	2140	957	114	914	409
V/C Ratio(X)	0.75	0.60	0.42	0.93	0.44	0.68	0.44	0.44	0.29	0.80	0.99	0.25
Avail Cap(c_a), veh/h	166	570	1119	136	572	486	711	2140	957	141	914	409
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	48.5	49.3	7.5	50.4	51.0	36.5	23.7	11.4	10.1	50.7	40.4	32.2
Incr Delay (d2), s/veh	16.8	4.1	0.4	55.8	3.4	10.2	0.4	0.7	0.7	22.1	26.4	1.5
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	4.5	2.6	3.6	5.9	1.2	1.5	6.9	7.8	4.1	3.4	17.0	2.7
LnGrp Delay(d),s/veh	65.4	53.4	7.9	106.2	54.4	46.7	24.1	12.1	10.9	72.8	66.9	33.7
LnGrp LOS	E	D	A	F	D	D	C	B	B	E	E	C
Approach Vol, veh/h		519			214			1524			1096	
Approach Delay, s/veh		28.8			83.1			14.3			64.2	
Approach LOS		C			F			B			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.4	72.5	12.7	13.5	49.8	34.0	15.7	10.5
Change Period (Y+Rc), s	* 4.2	5.3	* 4.2	5.3	5.3	* 5.3	5.3	* 5.3
Max Green Setting (Gmax), s	* 8.8	39.7	* 8.5	34.0	19.8	* 29	8.4	* 34
Max Q Clear Time (g_c+I1), s	7.6	17.7	9.8	6.7	16.1	30.1	9.6	4.9
Green Ext Time (p_c), s	0.0	7.3	0.0	1.4	0.3	0.0	0.0	0.3

Intersection Summary		
HCM 2010 Ctrl Delay		37.3
HCM 2010 LOS		D

Notes

Intersection	
Intersection Delay, s/veh	12.3
Intersection LOS	B

Approach	WB	NB	SB
Entry Lanes	1	2	2
Conflicting Circle Lanes	2	2	2
Adj Approach Flow, veh/h	30	1468	1285
Demand Flow Rate, veh/h	31	1513	1323
Vehicles Circulating, veh/h	1495	3	19
Vehicles Exiting, veh/h	21	1339	1507
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	10.6	13.3	11.1
Approach LOS	B	B	B

Lane	Left	Left	Right	Left	Right
Designated Moves	LR	LT	TR	LT	TR
Assumed Moves	LR	LT	TR	LT	TR
RT Channelized					
Lane Util	1.000	0.470	0.530	0.470	0.530
Critical Headway, s	4.113	4.293	4.113	4.293	4.113
Entry Flow, veh/h	31	711	802	622	701
Cap Entry Lane, veh/h	397	1127	1128	1114	1115
Entry HV Adj Factor	0.968	0.971	0.970	0.971	0.971
Flow Entry, veh/h	30	690	778	604	681
Cap Entry, veh/h	384	1094	1094	1081	1083
V/C Ratio	0.078	0.631	0.711	0.558	0.629
Control Delay, s/veh	10.6	11.9	14.5	10.2	11.9
LOS	B	B	B	B	B
95th %tile Queue, veh	0	5	6	4	5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	247	394	75	373	301	45	15	1105	296	17	1078	119
Future Volume (veh/h)	247	394	75	373	301	45	15	1105	296	17	1078	119
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h	268	428	82	405	327	49	16	1201	322	18	1172	129
Adj No. of Lanes	1	1	1	2	1	1	1	2	1	1	2	1
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, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	290	467	397	467	415	353	32	1302	583	36	1309	586
Arrive On Green	0.17	0.25	0.25	0.14	0.22	0.22	0.02	0.37	0.37	0.02	0.37	0.37
Sat Flow, veh/h	1757	1845	1568	3408	1845	1568	1757	3505	1568	1757	3505	1568
Grp Volume(v), veh/h	268	428	82	405	327	49	16	1201	322	18	1172	129
Grp Sat Flow(s),veh/h/ln	1757	1845	1568	1704	1845	1568	1757	1752	1568	1757	1752	1568
Q Serve(g_s), s	12.8	19.3	3.5	9.9	14.3	2.1	0.8	28.0	13.9	0.9	26.9	4.8
Cycle Q Clear(g_c), s	12.8	19.3	3.5	9.9	14.3	2.1	0.8	28.0	13.9	0.9	26.9	4.8
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	290	467	397	467	415	353	32	1302	583	36	1309	586
V/C Ratio(X)	0.92	0.92	0.21	0.87	0.79	0.14	0.49	0.92	0.55	0.50	0.90	0.22
Avail Cap(c_a), veh/h	290	484	411	467	432	367	103	1326	593	103	1326	593
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	35.1	31.0	25.1	36.1	31.2	26.5	41.5	25.6	21.2	41.4	25.2	18.3
Incr Delay (d2), s/veh	33.4	21.9	0.3	15.7	9.1	0.2	11.1	10.7	1.1	10.5	8.2	0.2
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	8.9	12.6	1.5	5.7	8.3	0.9	0.5	15.4	6.1	0.5	14.3	2.1
LnGrp Delay(d),s/veh	68.5	52.9	25.4	51.8	40.3	26.6	52.6	36.3	22.3	51.9	33.4	18.4
LnGrp LOS	E	D	C	D	D	C	D	D	C	D	C	B
Approach Vol, veh/h		778			781			1539			1319	
Approach Delay, s/veh		55.4			45.4			33.6			32.2	
Approach LOS		E			D			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	5.9	37.0	15.9	26.5	5.8	37.2	18.3	24.1				
Change Period (Y+Rc), s	* 4.2	5.3	* 4.2	4.9	* 4.2	5.3	* 4.2	4.9				
Max Green Setting (Gmax), s	* 5	32.3	* 12	22.4	* 5	32.3	* 14	20.0				
Max Q Clear Time (g_c+I1), s	2.9	30.0	11.9	21.3	2.8	28.9	14.8	16.3				
Green Ext Time (p_c), s	0.0	1.8	0.0	0.3	0.0	2.3	0.0	0.7				
Intersection Summary												
HCM 2010 Ctrl Delay			39.1									
HCM 2010 LOS			D									
Notes												

Intersection: 1: Fowler Avenue & Clinton Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	UL	T	T	R	L	T	TR
Maximum Queue (ft)	96	200	305	814	180	226	233	248	120	358	550	562
Average Queue (ft)	53	99	228	204	39	113	114	131	40	52	295	315
95th Queue (ft)	93	169	326	484	109	197	212	223	83	184	470	485
Link Distance (ft)		2644		1254			1232	1232			2590	2590
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	150		225		105	175			250	255		
Storage Blk Time (%)		2	16	12	0	4	1	0			13	
Queuing Penalty (veh)		1	48	56	0	13	2	0			6	

Intersection: 2: Fowler Avenue & Kerry Avenue

Movement	WB	NB	SB
Directions Served	R	TR	L
Maximum Queue (ft)	118	46	95
Average Queue (ft)	57	3	32
95th Queue (ft)	93	19	73
Link Distance (ft)	2442	1202	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			250
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Fowler Avenue & McKinley Avenue

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	150	68	250	353	426	85	367	259	262	81	369	412
Average Queue (ft)	48	25	77	231	79	27	220	122	145	31	100	260
95th Queue (ft)	104	62	165	345	228	58	331	228	249	65	229	383
Link Distance (ft)		4012			2552			1282	1282			1202
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250		250	250		250	250			250	250	
Storage Blk Time (%)			0	9	0		7	0	1			12
Queuing Penalty (veh)			0	16	0		23	1	1			12

Intersection: 3: Fowler Avenue & McKinley Avenue

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	420	370
Average Queue (ft)	274	43
95th Queue (ft)	390	148
Link Distance (ft)	1202	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		250
Storage Blk Time (%)	18	
Queuing Penalty (veh)	17	

Intersection: 4: Fowler Avenue & Floradora Avenue

Movement	WB	NB	NB	SB	SB
Directions Served	LR	T	TR	LT	T
Maximum Queue (ft)	50	140	109	114	113
Average Queue (ft)	10	30	4	25	6
95th Queue (ft)	33	79	36	72	46
Link Distance (ft)	1204	1209	1209	1282	1282
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 5: Fowler Avenue & Olive Avenue

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	L	L	T	R	L	T	T	R	L
Maximum Queue (ft)	152	177	41	250	300	974	20	92	305	300	69	366
Average Queue (ft)	91	77	13	181	239	344	4	30	177	187	32	47
95th Queue (ft)	136	144	34	261	346	667	17	66	263	276	59	152
Link Distance (ft)		2633				2558			2530	2530		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	185		250	200	200		250	250			250	250
Storage Blk Time (%)		0		5	10	28			2	2		
Queuing Penalty (veh)		0		24	50	165			1	3		

Intersection: 5: Fowler Avenue & Olive Avenue

Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	583	563	370
Average Queue (ft)	326	336	94
95th Queue (ft)	508	519	321
Link Distance (ft)	1209	1209	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			250
Storage Blk Time (%)	20	24	
Queuing Penalty (veh)	7	26	

Network Summary

Network wide Queuing Penalty: 471

Intersection: 1: Fowler Avenue & Clinton Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	UL	T	T	R	L	T	TR
Maximum Queue (ft)	249	311	298	312	43	96	338	360	162	194	199	265
Average Queue (ft)	94	163	166	75	19	44	132	142	85	75	131	143
95th Queue (ft)	180	265	253	179	38	87	245	267	142	145	218	227
Link Distance (ft)		2642		1253			1232	1232			2626	2626
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	150		225		105	175			250	255		
Storage Blk Time (%)	1	15	2	3			4	1				
Queuing Penalty (veh)	2	21	3	8			3	3				

Intersection: 2: Fowler Avenue & Kerry Avenue

Movement	WB	NB	SB
Directions Served	R	TR	L
Maximum Queue (ft)	92	50	66
Average Queue (ft)	28	2	14
95th Queue (ft)	56	18	41
Link Distance (ft)	2442	1202	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			250
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Fowler Avenue & McKinley Avenue

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	189	131	162	174	62	61	300	239	258	83	134	322
Average Queue (ft)	77	48	80	94	25	20	162	120	139	34	63	129
95th Queue (ft)	145	111	135	163	51	45	265	203	231	70	117	226
Link Distance (ft)		3965			2552			1283	1283			1202
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250		250	250		250	250			250	250	
Storage Blk Time (%)							2	0	1			2
Queuing Penalty (veh)							8	0	3			1

Intersection: 3: Fowler Avenue & McKinley Avenue

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	363	65
Average Queue (ft)	144	27
95th Queue (ft)	261	57
Link Distance (ft)	1202	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		250
Storage Blk Time (%)	2	
Queuing Penalty (veh)	2	

Intersection: 4: Fowler Avenue & Floradora Avenue

Movement	WB	NB	SB
Directions Served	LR	T	LT
Maximum Queue (ft)	50	82	90
Average Queue (ft)	14	18	19
95th Queue (ft)	41	58	59
Link Distance (ft)	1204	1209	1283
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Fowler Avenue & Olive Avenue

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	L	L	T	R	L	T	T	R	L
Maximum Queue (ft)	305	975	370	249	265	390	44	46	278	237	179	48
Average Queue (ft)	181	320	65	105	122	153	13	6	175	168	74	12
95th Queue (ft)	351	631	235	191	208	270	34	25	252	245	131	39
Link Distance (ft)		2633				2558			2530	2530		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	185		250	200	200		250	250			250	250
Storage Blk Time (%)	2	36		0	1	4			1	0		
Queuing Penalty (veh)	11	117		1	3	15			0	0		

Intersection: 5: Fowler Avenue & Olive Avenue

Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	348	329	89
Average Queue (ft)	201	197	24
95th Queue (ft)	313	299	57
Link Distance (ft)	1209	1209	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			250
Storage Blk Time (%)	3	3	
Queuing Penalty (veh)	0	3	

Network Summary

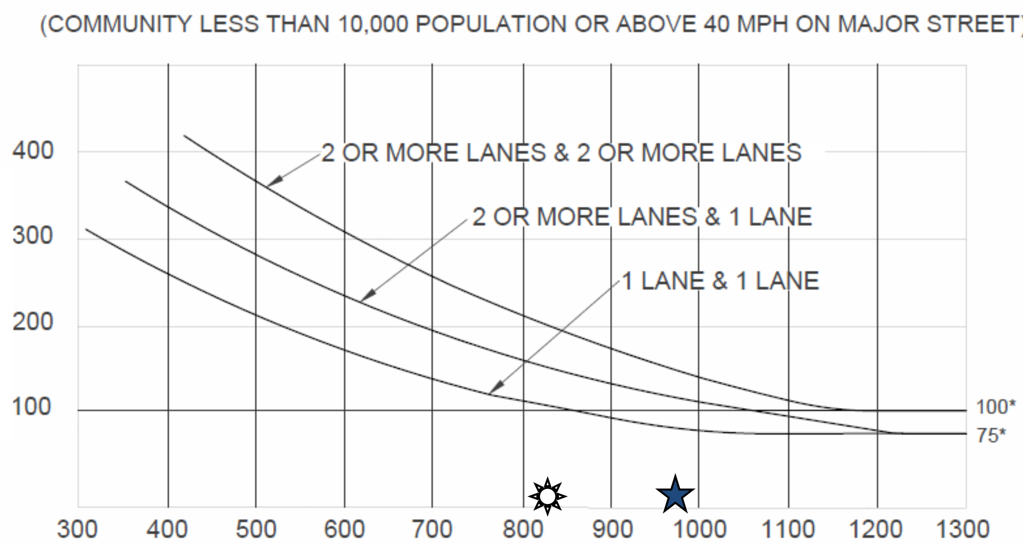
Network wide Queuing Penalty: 206

Appendix J: Signal Warrants

Warrant 3: Peak Hour (Rural)

Existing Traffic Conditions
4. Fowler Avenue / Floradora Avenue
AM (PM) Peak Hour

Floradora Avenue
Highest Approach Volume =
14 (14) VPH



Fowler Avenue Total of Both Approaches =
837 (970) VPH

*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

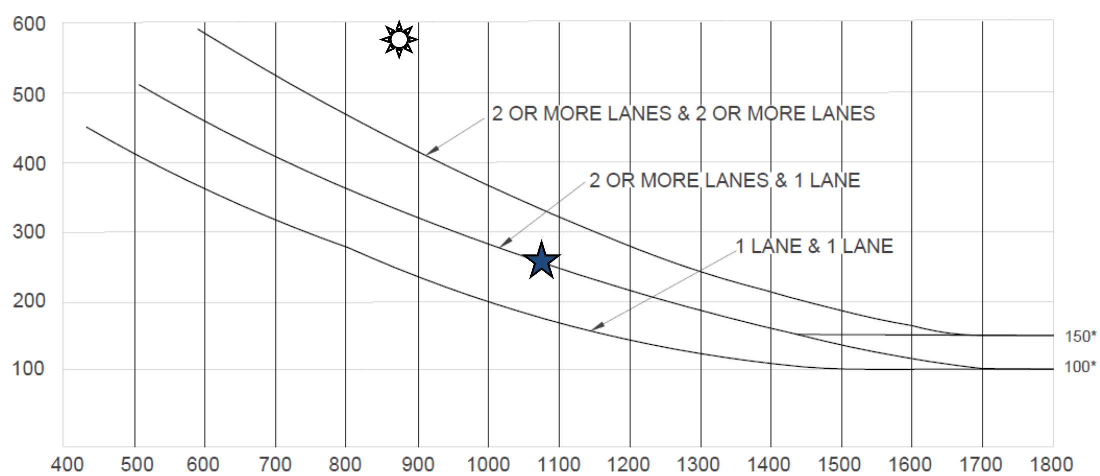
AM Peak Hour – Signal Warrant is Not Met
PM Peak Hour – Signal Warrant is Not Met

Source: California Manual of Uniform Traffic Control Devices (CA MUTCD 2014 Edition)
Chapter 4C: Traffic Control Signal Needs Studies
Part 4: Highway Traffic Signals
November 7, 2014

Warrant 3: Peak Hour (Urban)

Existing Traffic Conditions
5. Fowler Avenue / Olive Avenue
AM (PM) Peak Hour

Olive Avenue Highest Approach Volume = 571 (252) VPH



Fowler Avenue Total of Both Approaches = 892 (1084) VPH

*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor street approach with one lane.

AM Peak Hour – Signal Warrant is Met

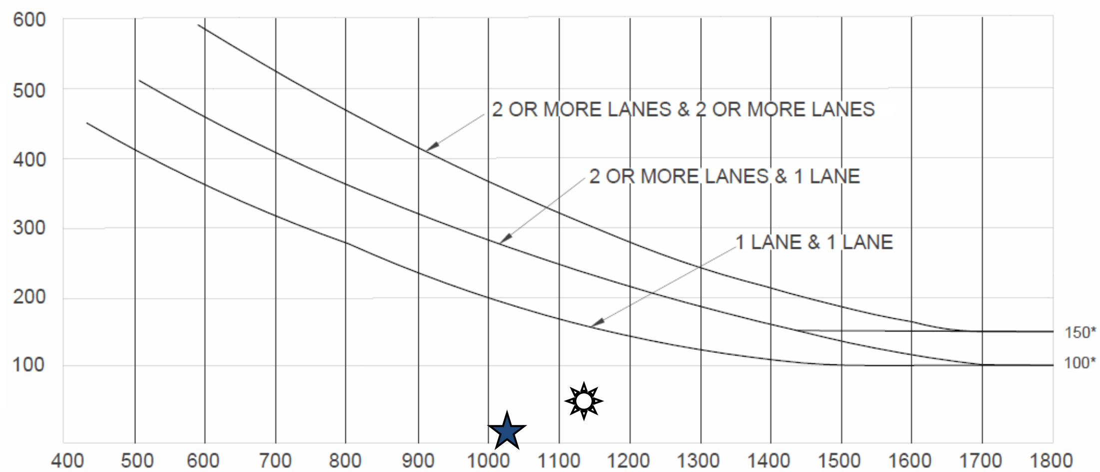
PM Peak Hour – Signal Warrant is Met

Source: California Manual of Uniform Traffic Control Devices (CA MUTCD 2014 Edition)
Chapter 4C: Traffic Control Signal Needs Studies
Part 4: Highway Traffic Signals
November 7, 2014

Warrant 3: Peak Hour (Urban)

Existing plus Project Traffic Conditions
2. Fowler Avenue / Kerry Avenue
AM (PM) Peak Hour

Kerry Avenue Highest Approach Volume = 63 (18) VPH



Fowler Avenue Total of Both Approaches = 1131 (1018) VPH

*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor street approach with one lane.

☼ **AM Peak Hour – Signal Warrant is Not Met**

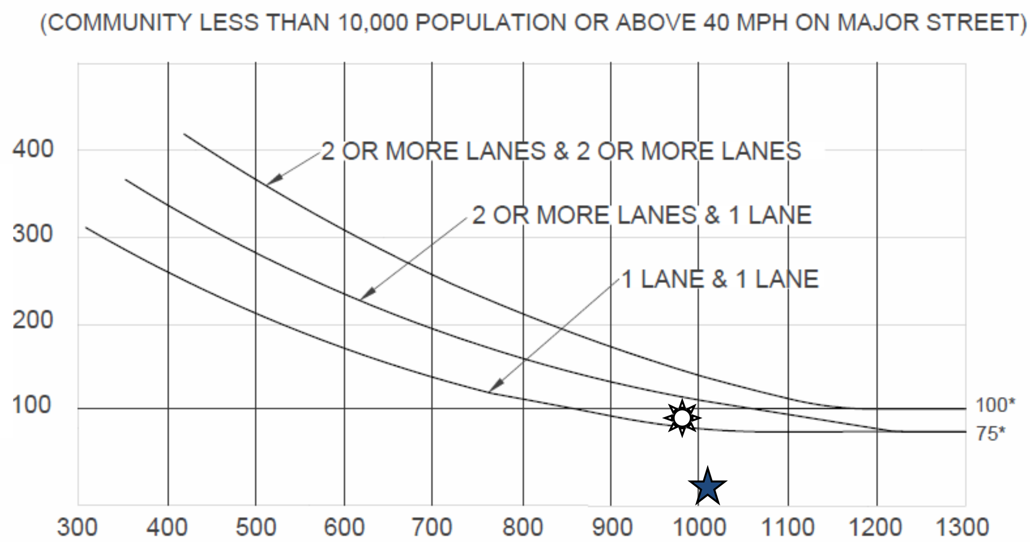
★ **PM Peak Hour – Signal Warrant is Not Met**

Source: California Manual of Uniform Traffic Control Devices (CA MUTCD 2014 Edition)
Chapter 4C: Traffic Control Signal Needs Studies
Part 4: Highway Traffic Signals
November 7, 2014

Warrant 3: Peak Hour (Rural)

Existing plus Project Traffic Conditions
3. Fowler Avenue / McKinley Avenue
AM (PM) Peak Hour

McKinley Avenue Highest Approach Volume = 87 (26) VPH



Fowler Avenue Total of Both Approaches =

985 (1004) VPH

*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

☼ **AM Peak Hour – Signal Warrant is Met**

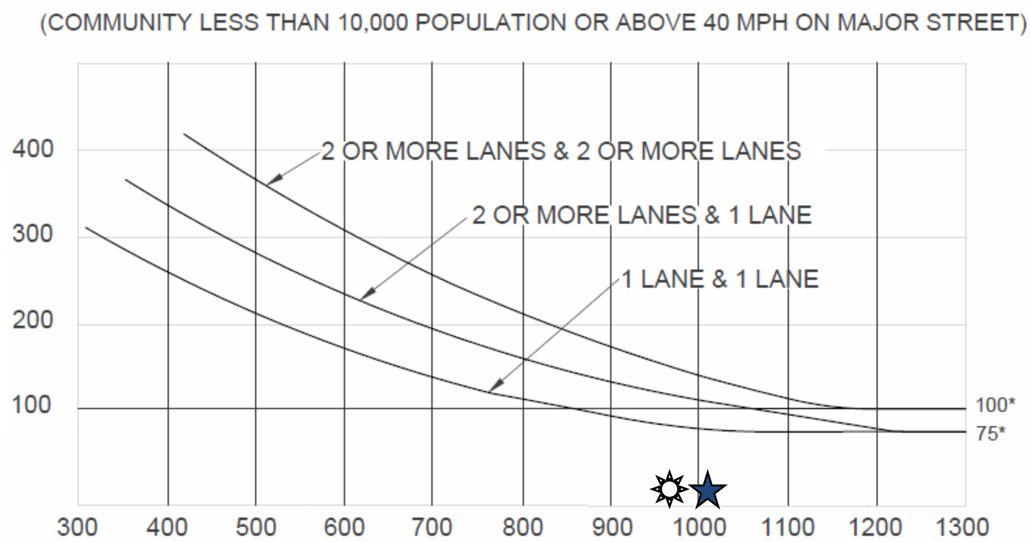
★ **PM Peak Hour – Signal Warrant is Not Met**

Source: California Manual of Uniform Traffic Control Devices (CA MUTCD 2014 Edition)
Chapter 4C: Traffic Control Signal Needs Studies
Part 4: Highway Traffic Signals
November 7, 2014

Warrant 3: Peak Hour (Rural)

Existing plus Project Traffic Conditions
4. Fowler Avenue / Floradora Avenue
AM (PM) Peak Hour

Floradora Avenue Highest Approach Volume = 16 (15) VPH



Fowler Avenue Total of Both Approaches = 961 (1004) VPH

*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

☼ **AM Peak Hour – Signal Warrant is Not Met**

★ **PM Peak Hour – Signal Warrant is Not Met**

Source: California Manual of Uniform Traffic Control Devices (CA MUTCD 2014 Edition)
Chapter 4C: Traffic Control Signal Needs Studies
Part 4: Highway Traffic Signals
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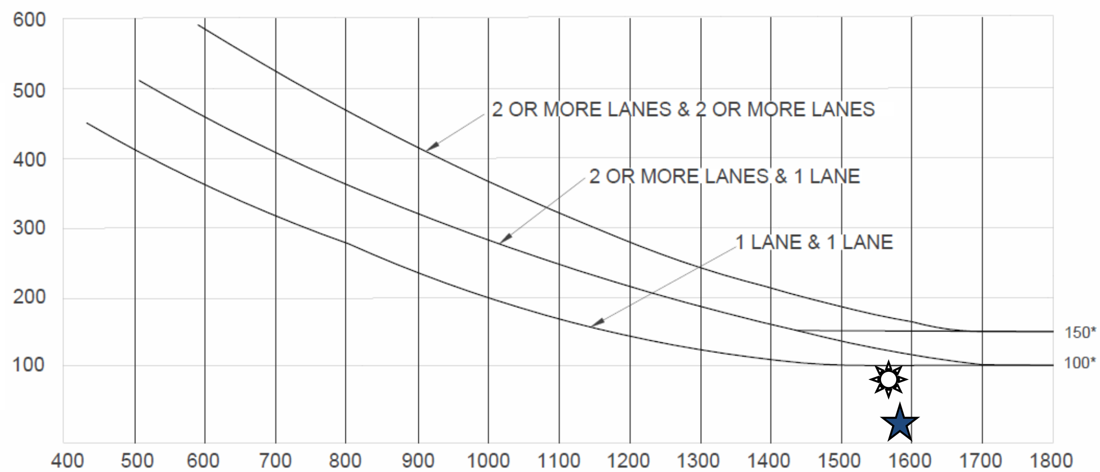
Warrant 3: Peak Hour (Urban)

Near Term plus Project Traffic Conditions
2. Fowler Avenue / Kerry Avenue
AM (PM) Peak Hour

Kerry Avenue
Highest Approach Volume =
88 (31) VPH



Fowler Avenue Total of Both Approaches =
1573 (1589) VPH

*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor street approach with one lane.

AM Peak Hour – Signal Warrant is Not Met
PM Peak Hour – Signal Warrant is Not Met

Source: California Manual of Uniform Traffic Control Devices (CA MUTCD 2014 Edition)
Chapter 4C: Traffic Control Signal Needs Studies
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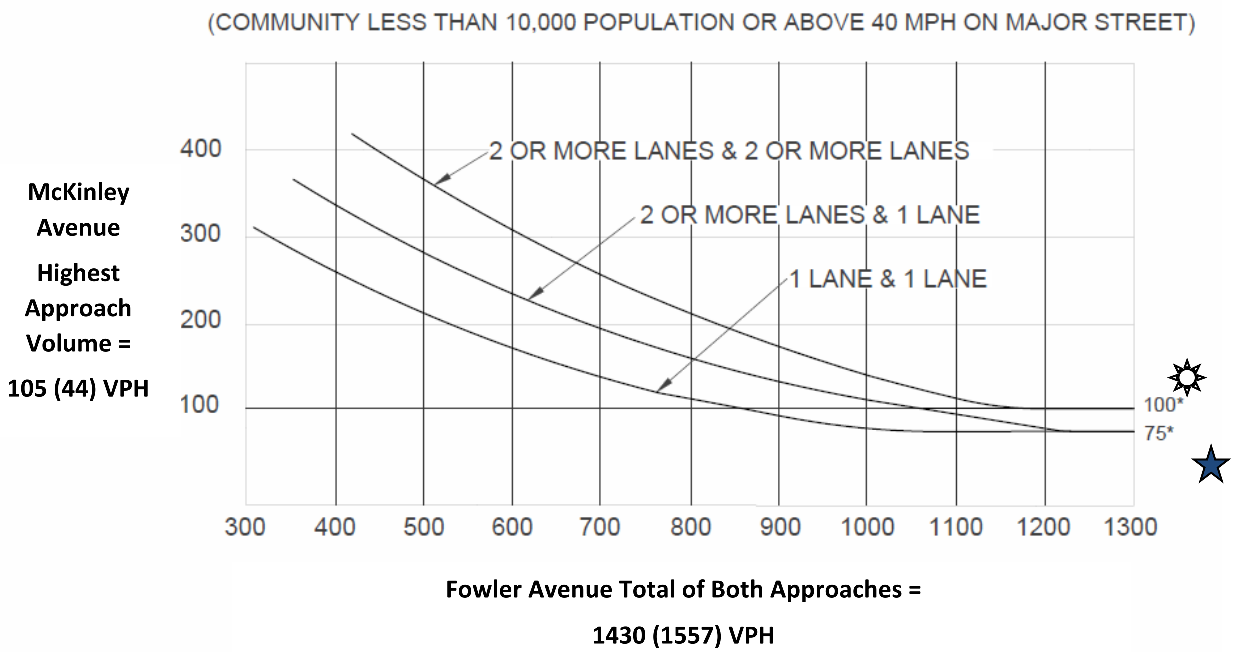
November 7, 2014

Warrant 3: Peak Hour (Rural)

Near Term plus Project Traffic Conditions
3. Fowler Avenue / McKinley Avenue
AM (PM) Peak Hour



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

AM Peak Hour – Signal Warrant is Met
PM Peak Hour – Signal Warrant is Not Met

Source: California Manual of Uniform Traffic Control Devices (CA MUTCD 2014 Edition)
Chapter 4C: Traffic Control Signal Needs Studies
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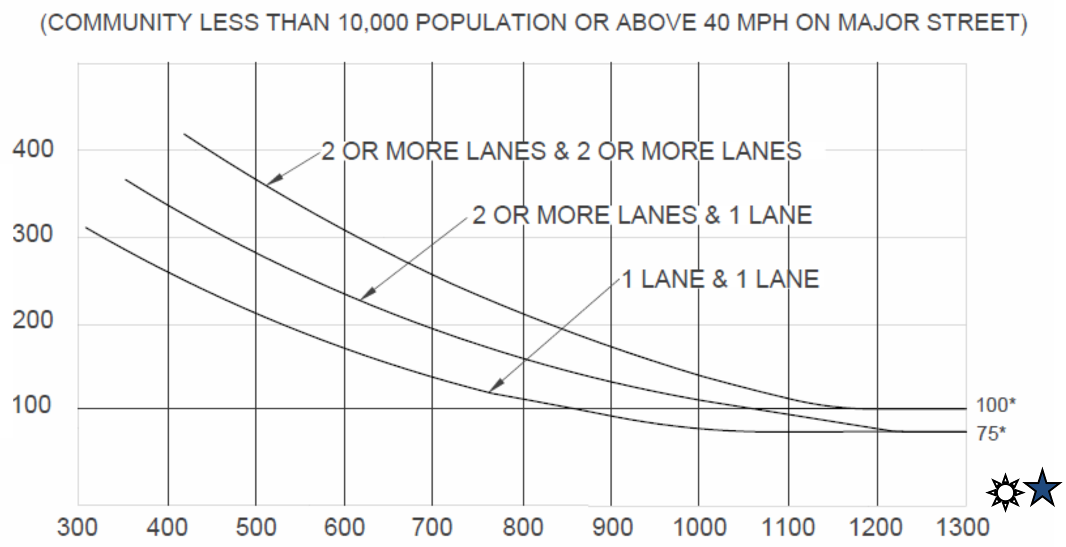
November 7, 2014

Warrant 3: Peak Hour (Rural)

Near Term plus Project Traffic Conditions
4. Fowler Avenue / Floradora Avenue
AM (PM) Peak Hour

Floradora Avenue Highest Approach Volume = 19 (23) VPH



Fowler Avenue Total of Both Approaches =

1447 (1599) VPH

*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

☼ **AM Peak Hour – Signal Warrant is Not Met**

★ **PM Peak Hour – Signal Warrant is Not Met**

Source: California Manual of Uniform Traffic Control Devices (CA MUTCD 2014 Edition)
Chapter 4C: Traffic Control Signal Needs Studies
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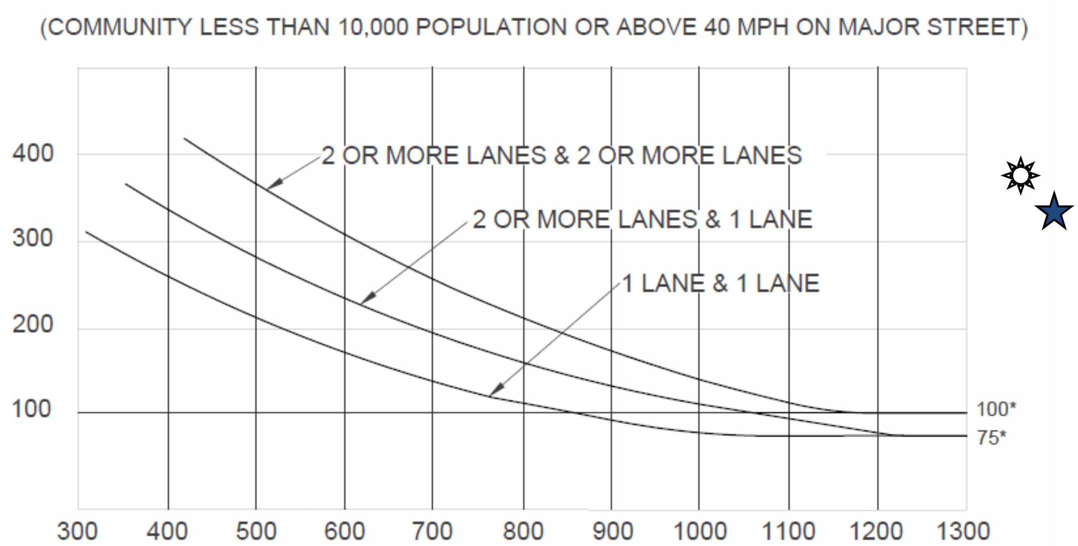
November 7, 2014

Warrant 3: Peak Hour (Rural)

Cumulative Year 2035 No Project Traffic Conditions
3. Fowler Avenue / McKinley Avenue
AM (PM) Peak Hour

McKinley Avenue Highest Approach Volume = 378 (327) VPH



Fowler Avenue Total of Both Approaches = 1910 (2324) VPH

*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

AM Peak Hour – Signal Warrant is Met
PM Peak Hour – Signal Warrant is Met

Source: California Manual of Uniform Traffic Control Devices (CA MUTCD 2014 Edition)
Chapter 4C: Traffic Control Signal Needs Studies
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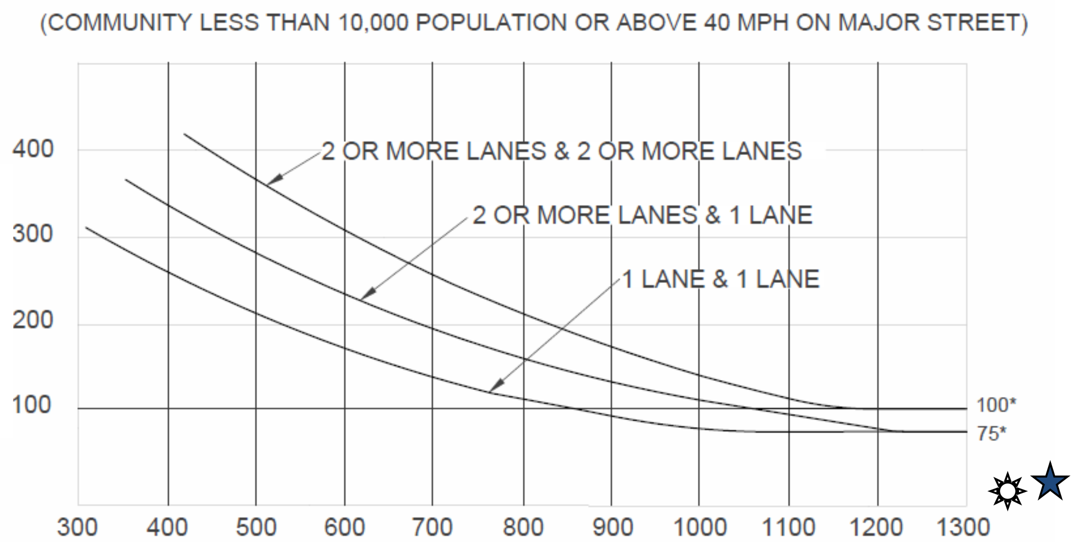
November 7, 2014

Warrant 3: Peak Hour (Rural)

Cumulative Year 2035 No Project Traffic Conditions
4. Fowler Avenue / Floradora Avenue
AM (PM) Peak Hour

Floradora Avenue Highest Approach Volume = 17 (22) VPH



Fowler Avenue Total of Both Approaches =

2314 (2582) VPH

*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

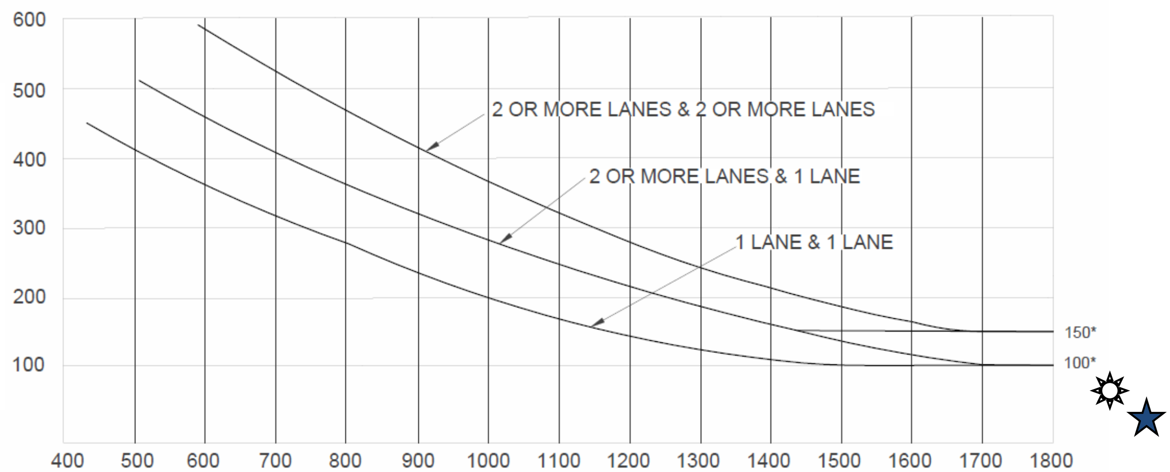
AM Peak Hour – Signal Warrant is Not Met
PM Peak Hour – Signal Warrant is Not Met

Source: California Manual of Uniform Traffic Control Devices (CA MUTCD 2014 Edition)
Chapter 4C: Traffic Control Signal Needs Studies
Part 4: Highway Traffic Signals
November 7, 2014

Warrant 3: Peak Hour (Urban)

Cumulative Year 2035 plus Project Traffic Conditions
2. Fowler Avenue / Kerry Avenue
AM (PM) Peak Hour

Kerry Avenue Highest Approach Volume = 81 (28) VPH



Fowler Avenue Total of Both Approaches = 1838 (2010) VPH

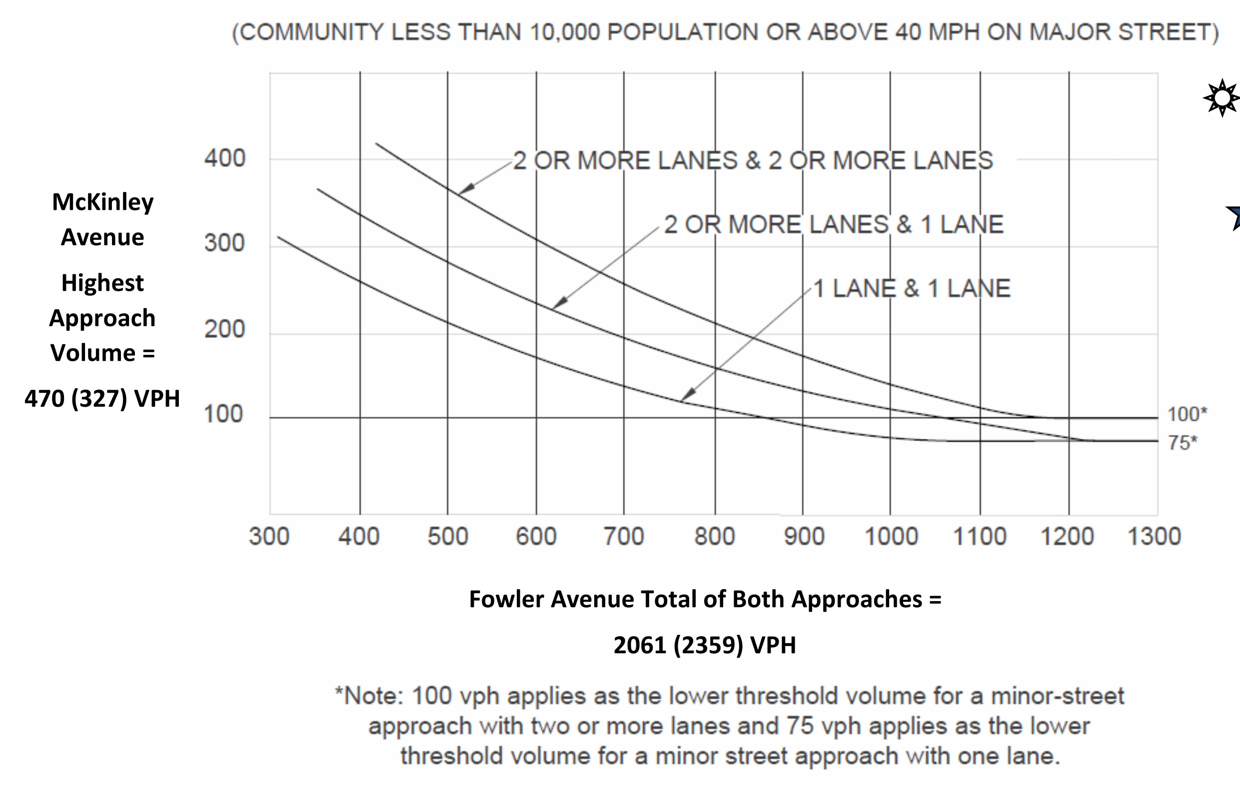
*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor street approach with one lane.

AM Peak Hour – Signal Warrant is Not Met
PM Peak Hour – Signal Warrant is Not Met

Source: California Manual of Uniform Traffic Control Devices (CA MUTCD 2014 Edition)
Chapter 4C: Traffic Control Signal Needs Studies
Part 4: Highway Traffic Signals
November 7, 2014

Warrant 3: Peak Hour (Rural)

Cumulative Year 2035 plus Project Traffic Conditions
3. Fowler Avenue / McKinley Avenue
AM (PM) Peak Hour



AM Peak Hour – Signal Warrant is Met

PM Peak Hour – Signal Warrant is Met

Source: California Manual of Uniform Traffic Control Devices (CA MUTCD 2014 Edition)
Chapter 4C: Traffic Control Signal Needs Studies
Part 4: Highway Traffic Signals
November 7, 2014

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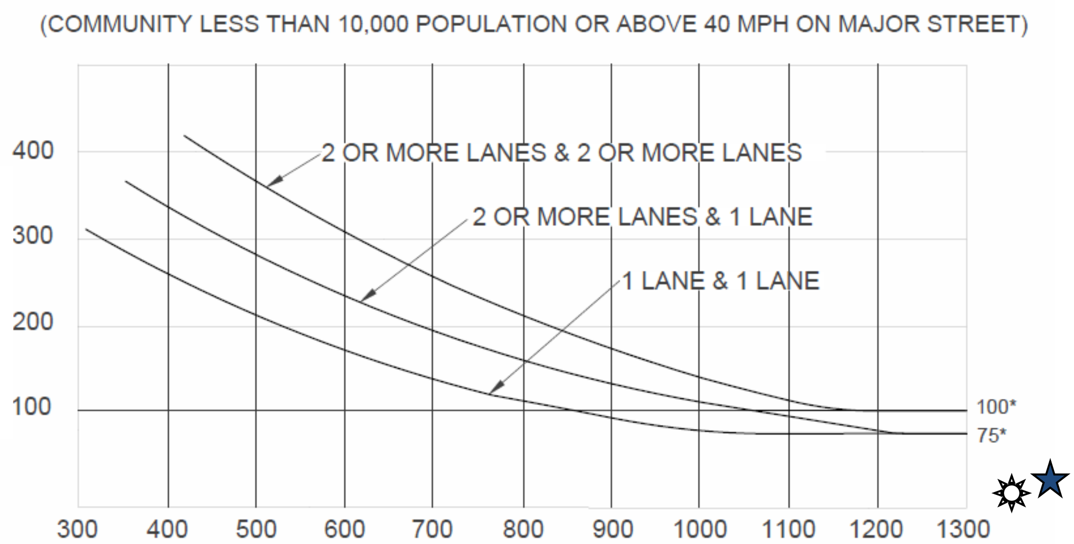
Warrant 3: Peak Hour (Rural)

Cumulative Year 2035 plus Project Traffic Conditions
4. Fowler Avenue / Floradora Avenue
AM (PM) Peak Hour

Floradora Avenue Highest Approach Volume =
18 (23) VPH



Fowler Avenue Total of Both Approaches =
2442 (2615) VPH

*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

☼ **AM Peak Hour – Signal Warrant is Not Met**
★ **PM Peak Hour – Signal Warrant is Not Met**

Source: California Manual of Uniform Traffic Control Devices (CA MUTCD 2014 Edition)
Chapter 4C: Traffic Control Signal Needs Studies
Part 4: Highway Traffic Signals
November 7, 2014