Appendix A

Biological Evaluation

LIVE OAK ASSOCIATES, INC.
an Ecological Consulting Firm

CITY OF SANGER GENERAL PLAN UPDATE
BIOLOGICAL EVALUATION
CITY OF SANGER, CALIFORNIA

Prepared by

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EXECUTIVE SUMMARY

Live Oak Associates, Inc. (LOA) conducted an investigation of the biological resources of the City of Sanger General Plan Update (GPU) Area (planning area) in Fresno County, California, and evaluated likely impacts to such resources resulting from implementation of the GPU. In September and October 2015, LOA conducted a field survey to identify the planning area's biotic habitats and land uses, the plants and animals occurring in those habitats, and significant habitat values that may be protected by state and federal law.

The 6,900-acre planning area encompasses municipal Sanger and outlying rural lands within which annexation and growth are expected by the year 2035. The biotic habitats/land uses of the planning area are characterized as urban, agriculture, rural developed, ruderal, non-native grassland, drainages/canals, and artificial ponds and basins. The Kings River, Collins Creek, and five irrigation canals pass through the planning area. The Kings River and Collins Creek are known Waters of the U.S., and the U.S. Army Corps of Engineers may also assert jurisdiction over some or all of the irrigation canals. The California Department of Fish and Wildlife regulates activities within the Kings River and Collins Creek, but is not expected to claim jurisdiction over the canals. All aquatic features of the planning area are Waters of the State subject to the regulatory authority of the Central Valley Regional Water Quality Control Board.

Future projects in the planning area have the potential to significantly impact a number of special status plant and animal species. These include the Sanford's arrowhead, western pond turtle, Swainson's hawk, burrowing owl, long-eared owl, northern harrier, white-tailed kite, tricolored blackbird, loggerhead shrike, American badger, pallid bat, western mastiff bat, and Townsend's big-eared bat. Future projects also have the potential to significantly impact nesting migratory birds and raptors protected under the California Fish and Game Code, roosting native bat species, sensitive riparian habitat along the Kings River and Collins Creek, wildlife movement corridors, Waters of the U.S., and downstream water quality. By implementing future projects during lower-risk times of year for protected species, avoiding active nests, dens, and roosts identified during preconstruction surveys, passively relocating burrowing owls and providing compensatory mitigation for loss of occupied burrowing owl habitat as needed, actively relocating western pond turtles as necessary, salvaging Sanford's arrowhead plants as necessary, quantifying impacts to riparian trees and providing compensatory mitigation as necessary, delineating Waters of the U.S. and obtaining and complying with permits for any impacts to such waters, and/or implementing appropriate erosion control measures and a Stormwater Pollution Prevention Plan, project applicants can reduce the magnitude of their impacts to a less than significant level under CEQA and remain in compliance with state and federal laws protecting biological resources.

Future projects in the planning area do not have the potential to significantly impact eleven special status plant species and seven special status animal species that would not be found on site, or to impact designated critical habitat for threatened or endangered species. It is assumed that future projects in the planning area will be consistent with the goals and policies of the Sanger General Plan; therefore, no significant impacts with respect to local policies are anticipated.

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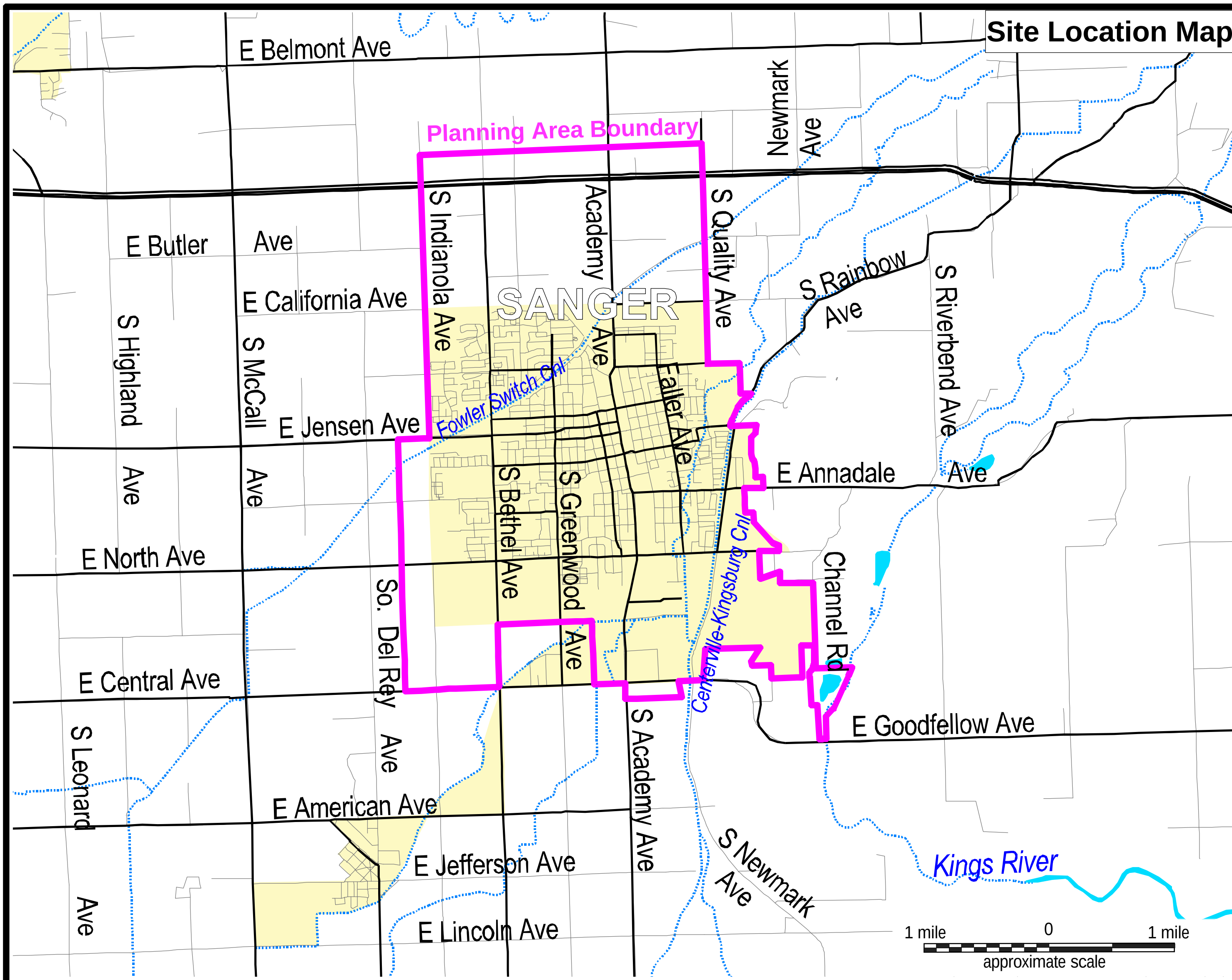
1.0 INTRODUCTION

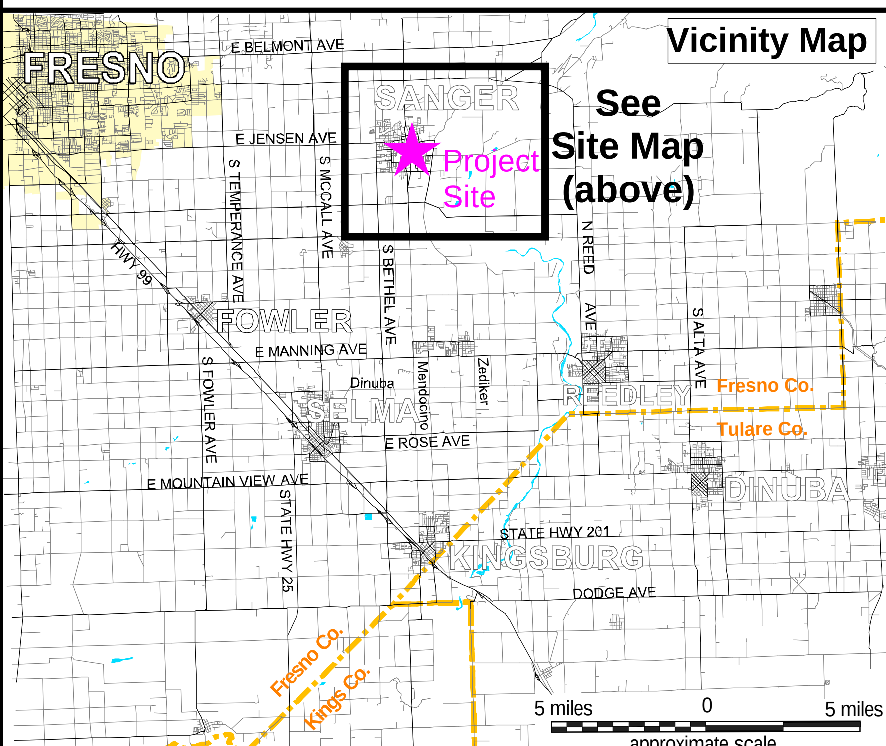
Live Oak Associates, Inc. (LOA) has prepared the following report, which describes the biotic resources located within the approximate 6,900-acre City of Sanger General Plan Update (GPU) area (hereafter referred to as the "planning area"), and evaluates likely impacts to these resources resulting from implementation of the Sanger GPU. Sanger is located in Fresno County, California, approximately six miles east of the limits of the City of Fresno (Figure 1). The city limits of Sanger encompass approximately 3,500 acres; however, the planning area is denoted by Sanger's larger Sphere of Influence (SOI), defined as that area within which annexation to the City may take place and growth may occur in a logical and efficient manner. The planning area may be found on the *Sanger* 7.5-minute U.S. Geological Survey (USGS) quadrangle in Township 14 South, Range 22 East, Mount Diablo Base and Meridian (Figure 2).

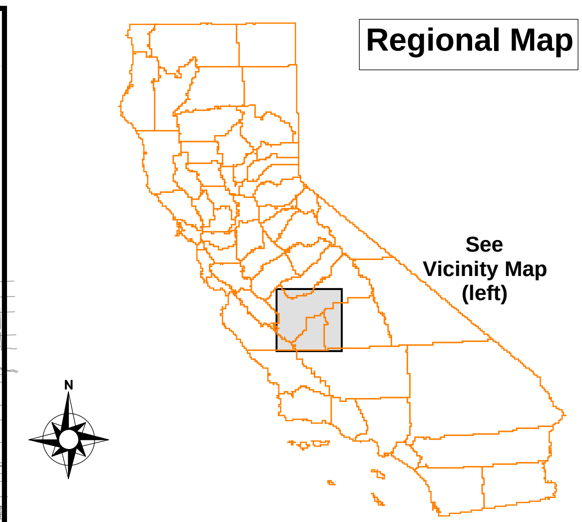
1.1 REPORT OBJECTIVES

The implementation of a new city or county general plan often leads to community development projects that may, in turn, damage or modify biotic habitats used by sensitive plant and wildlife species. General plans, as well as individual projects within the planning area, are subject to provisions of the California Environmental Quality Act (CEQA), other state and federal regulations, and local policies and ordinances. This report addresses issues related to: 1) sensitive biotic resources occurring in the planning area; 2) the federal, state, and local laws regulating such resources, and 3) mitigation measures which may be required to reduce the magnitude of anticipated impacts. As such, the objectives of this report are to:

- Summarize all site-specific information related to existing biological resources;
- Make reasonable inferences about the biological resources that could occur onsite based on habitat suitability and the proximity of the site to a species' known range;
- Summarize all state and federal natural resource protection laws that may be relevant to possible future site development;
- Identify and discuss potential impacts to biological resources likely to occur in the planning area within the context of CEQA or any state or federal laws; and







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Sanger General Plan Update
Site / Vicinity Map

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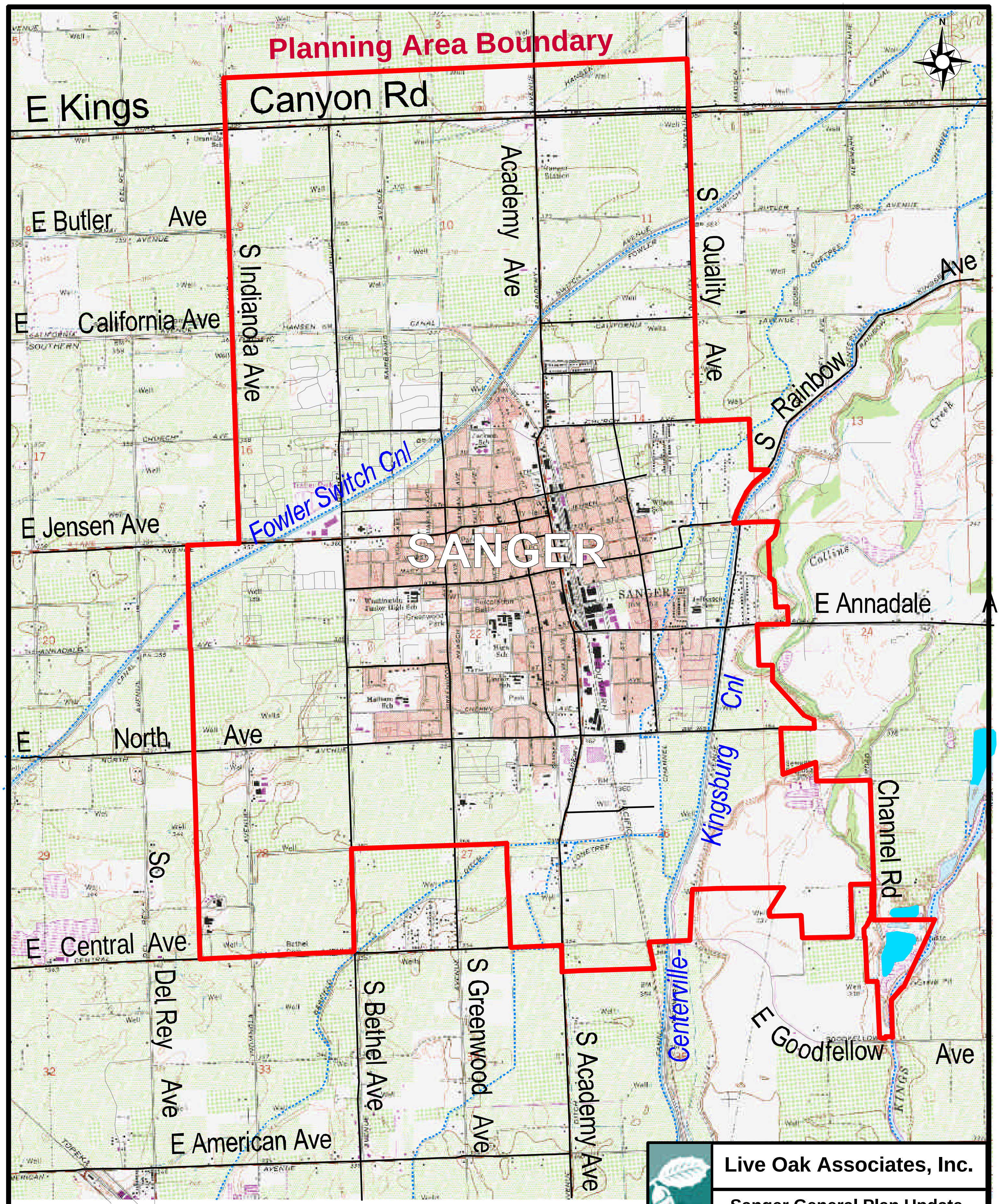

1 mile 0 1 mile

approximate scale

From USGS
Sanger 7.5' Quadrangle 1981

Live Oak Associates, Inc.

Sanger General Plan Update
U.S.G.S. Quadrangle

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- Identify avoidance and mitigation measures that would reduce impacts to a less-than-significant level (as identified by CEQA) and are generally consistent with recommendations of the resource agencies for affected biological resources.

1.2 OVERVIEW OF THE SANGER GENERAL PLAN UPDATE

State law requires that each city and county in California adopt a general plan to guide future development. A general plan should address a broad range of issues and at least seven elements that relate to land use, conservation, and development of land. The required elements include land use, circulation, housing, open space, conservation, noise, and safety. General plans must remain useful over a long period of time, typically 20 years or more; however, in some instances a general plan must be updated partway through its coverage period to reflect the community's changing needs and desires. The City of Sanger is updating its existing 2025 General Plan to facilitate sustainable development of the City to the year 2035 and beyond. The objective of the Sanger GPU is to project future growth within the 6,900-acre planning area, and provide a framework for this growth. Implementation of the GPU may facilitate a number of residential, commercial, and municipal development projects within the planning area. These individual projects must be implemented in accordance with GPU conservation objectives, including maintaining water quality, conserving soil resources, protecting open space, and preserving and enhancing wildlife habitat.

1.3 STUDY METHODOLOGY

The analysis of impacts, as discussed in Section 3.0 of this report, is based on the known and potential biotic resources of the planning area discussed in Section 2.0. Sources of information used in the preparation of this analysis included: (1) the *California Natural Diversity Data Base* (CDFW 2016a); (2) the *Inventory of Rare and Endangered Vascular Plants of California* (CNPS 2016); (3) manuals and references related to plants and animals of the San Joaquin Valley region; and (4) numerous biological investigations conducted by LOA of properties within and proximate to the planning area. A reconnaissance-level field survey of the planning area was conducted on September 2 and October 16, 2015 by LOA ecologist Rebekah Jensen. Prior to the field survey, Ms. Jensen examined aerial imagery and the Land Use and Circulation Map contained in the City of Sanger 2025 General Plan to target areas with potential sensitive or protected biological resources that could potentially be impacted by the implementation of the GPU. During the field survey, Ms. Jensen examined the planning area from public access roads and several City properties, and noted key habitat features and wildlife observations.

Detailed surveys for sensitive biological resources were not conducted for this study. The level of effort was sufficient to locate and establish the general extent of wetlands and special status species habitat that might be present, and to assess the need for more detailed investigations of particular areas that may be affected by future development projects.

2.0 EXISTING CONDITIONS

2.1 REGIONAL SETTING

The planning area is located in the southeastern San Joaquin Valley of California, approximately five miles west of the base of the Sierra Nevada foothills. The San Joaquin Valley is bordered by the Sierra Nevada to the east, the Tehachapi Mountains to the south, the California coastal ranges to the west, and the Sacramento-San Joaquin Delta to the north.

Like most of California, the San Joaquin Valley (and the planning area) experiences a Mediterranean climate. Warm, dry summers are followed by cool, moist winters. Summer temperatures in the project vicinity commonly exceed 100 degrees Fahrenheit, and the relative humidity is generally very low. Winter temperatures rarely exceed 70 degrees Fahrenheit. Annual precipitation in the project vicinity is about 11 inches, most of which falls between the months of October and March. Nearly all precipitation falls in the form of rain.

The principal drainage in the vicinity of Sanger is the Kings River, which originates in the Sierra Nevada and flows in a north-south direction past the planning area, bordering the planning area at its southeastern corner. The Kings River in the vicinity of the planning area follows a natural drainage channel and supports a relatively intact riparian corridor. Collins Creek, a tributary to the Kings River, flows through the southeastern portion of the planning area, and converges with the Kings River at the planning area's southeastern corner. Within the planning area, Collins Creek flows through an engineered channel, and supports intermittent riparian vegetation.

Lands surrounding the planning area are dominated by agricultural and rural residential uses.

2.2 PLANNING AREA

The approximately 6,900-acre planning area consists primarily of a mosaic of urban, agricultural, and rural residential lands. Riparian habitat associated with the Kings River and Collins Creek occurs in the southeastern portion of the planning area, and is contained largely within the fenced facility of the City's wastewater treatment plant and an adjacent City-owned natural area. Topographically, much of the site is relatively level, ranging in elevation from approximately

385 feet National Geodetic Vertical Datum (NGVD) at the northeast corner of the planning area to 325 feet NGVD at the southeast corner of the planning area. Selected photographs of the planning area are presented in Appendix A.

Thirty-seven soil mapping units representing eleven unique soil series were identified within the planning area, and are presented in Table 1 on the following pages. Of these, eighteen mapping units are considered hydric, meaning soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions conducive to the growth of wetland vegetation. However, most of the soils of the planning area have been intensively modified over years of agricultural production and urban land uses.

2.3 BIOTIC HABITATS AND LAND USES

Seven biotic habitats and land uses were identified within the planning area: urban, agricultural, rural developed, ruderal, non-native grassland, drainages/canals, and artificial ponds and basins (Figure 3). These habitats/land uses, along with their constituent plant and animal species, are described in detail in the following sections.

2.3.1 Urban

The urban footprint of Sanger is developed with single- and multi-family residential units, commercial units, schools, industrial and manufacturing plants and warehouses, transportation corridors, city parks, and other developments and infrastructure associated with urbanized communities. Sanger also includes a number of small undeveloped lots that are similar to surrounding urban areas in terms of habitat function and value, and are therefore included in the urban land use type. However, large expanses of vacant land within city limits were separately classified as ruderal (see Section 2.3.3).

Vegetation within urban areas is dominated by non-native ornamental trees, shrubs, forbs and grasses. Vacant lots within the urban footprint may contain naturalized non-native grasses and forbs such as Canadian horseweed (*Erigeron canadensis*), prickly lettuce (*Lactuca serriola*), red-stemmed filaree (*Erodium cicutarium*), and foxtail barley (*Hordeum murinum* ssp. *leporinum*).

Table 1. Soils of the City of Sanger General Plan Update Planning Area.

Map Unit Symbol	Map Unit Name	Acres in Sanger SOI	Percent of Sanger SOI	Hydric?
AoA	Atwater loamy sand, 0 to 3 percent slopes, MLRA 17	14.6	0.2%	No
ArA	Atwater sandy loam, 0 to 3 percent slopes	17.0	0.2%	No
AtA	Atwater sandy loam, moderately deep, 0 to 3 percent slopes	70.6	1.0%	No
DeA	Delhi sand, 0 to 3 percent slopes, MLRA 17	12.9	0.2%	No
DhA	Delhi loamy sand, 0 to 3 percent slopes, MLRA 17	1.9	0.0%	Yes
DlA	Delhi loamy sand, moderately deep, 0 to 3 percent slopes	49.7	0.7%	No
Dn	Dello sandy loam	11.1	0.2%	Yes
Es	Exeter sandy loam	506.9	7.4%	Yes
Et	Exeter sandy loam, shallow	177.0	2.6%	Yes
Ex	Exeter loam	11.8	0.2%	Yes
Gf	Grangeville fine sandy loam, 0 to 1 percent slopes, MLRA 17	125.2	1.8%	Yes
Gg	Grangeville fine sandy loam, saline alkali	86.0	1.3%	Yes
Gh	Grangeville fine sandy loam, water table	16.6	0.2%	Yes
Gk	Grangeville fine sandy loam, water table, saline alkali	28.1	0.4%	Yes
Gp	Grangeville soils, channeled	31.7	0.5%	Yes
GtA	Greenfield sandy loam, 0 to 3 percent slopes	357.0	5.2%	No
GuA	Greenfield sandy loam, moderately deep, 0 to 3 percent slopes	289.7	4.2%	No
Hc	Hanford sandy loam	1,327.3	19.3%	No
Hm	Hanford fine sandy loam	342.7	5.0%	No
Hsd	Hesperia sandy loam	46.9	0.7%	No
Hsr	Hesperia fine sandy loam	30.6	0.4%	No
M-W	Miscellaneous water	23.2	0.3%	No
Ra	Ramona sandy loam	1,042.8	15.2%	No
Rb	Ramona sandy loam, hard substratum	459.5	6.7%	No
Rc	Ramona loam	301.5	4.4%	No

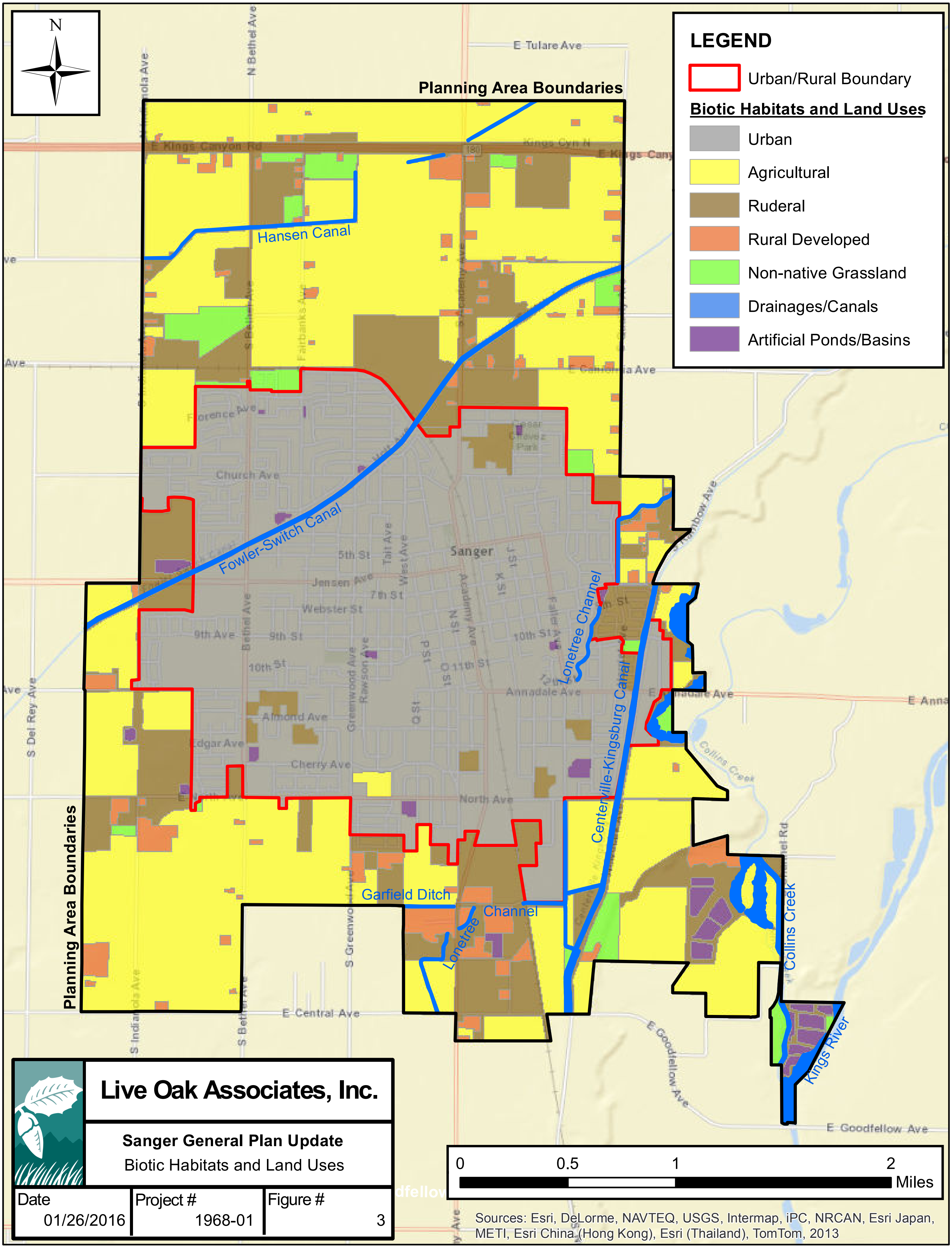
Table 1 (cont'd). Soils of the City of Sanger General Plan Update Planning Area.

Map Unit Symbol	Map Unit Name	Acres in Sanger SOI	Percent of Sanger SOI	Hydric?
Re	Ramona loam, hard substratum	91.4	1.3%	No
ScA	San Joaquin sandy loam, 0 to 3 percent slopes, MLRA 17	148.9	2.2%	Yes
SdA	San Joaquin sandy loam, shallow, 0 to 3 percent slopes	91.5	1.3%	Yes
SeA	San Joaquin loam, 0 to 3 percent slopes	92.7	1.3%	Yes
SgA	San Joaquin loam, shallow, 0 to 3 percent slopes	77.5	1.1%	Yes
Sw	Swamp	34.7	0.5%	Yes
ThF	Terrace escarpments	28.4	0.4%	No
TzaA	Tujunga sand, 0 to 3 percent slopes	10.5	0.2%	No
TzbA	Tujunga loamy sand, 0 to 3 percent slopes	773.0	11.3%	Yes
TzbB	Tujunga loamy sand, 3 to 9 percent slopes	90.1	1.3%	Yes
TzeB	Tujunga soils, channeled, 0 to 9 percent slopes	4.7	0.1%	Yes
W	Water	41.9	0.6%	No

Animals typically occurring in urban environments are well adapted to the presence of humans. In general, urban areas provide limited habitat for reptiles and amphibians; however, Pacific chorus frogs (*Pseudacris regilla*) may breed and forage in wet areas associated with residential areas or parks, and western fence lizards (*Sceloporus occidentalis*) likely occur here.

Various bird species are expected to use the urban footprint of Sanger. Birds known to occur in this portion of the planning area include house sparrows (*Passer domesticus*), rock pigeons (*Columba livia*), mourning doves (*Zenaida macroura*), western scrub jays (*Aphelocoma californica*), American robins (*Turdus migratorius*), American crows (*Corvus brachyrhynchos*), and northern mockingbirds (*Mimus polyglottos*), among others. Raptors such as red-tailed hawks (*Buteo jamaicensis*) and Cooper's hawks (*Accipiter cooperi*) may occur in this area as well.

Mammals occurring in the urban footprint of Sanger may include house mice (*Mus musculus*), Norway rats (*Rattus norvegicus*) raccoons (*Procyon lotor*), and Virginia opossums (*Didelphis*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LEGEND
Urban/Rural Boundary
Biotic Habitats and Land Uses
Urban
Agricultural
Ruderal
Rural Developed
Non-native Grassland
Drainages/Canals
Artificial Ponds/Basins
Planning Area Boundaries
Planning Area Boundaries
E Tulare Ave
N Bethel Ave
E Kings Canyon Rd
Hansen Canal
Fowler-Switch Canal
Florence Ave
Church Ave
Sanger
5th St
7th St
Jensen Ave
Webster St
9th Ave
9th St
10th St
11th St
10th St
Tait Ave
West Ave
Academy Ave
Bethel Ave
Greenwood Ave
Rawson Ave
Almond Ave
Edgar Ave
Cherry Ave
North Ave
Annadale Ave
E Annadale Ave
Lonetree Channel
Centerville-Kingsburg Canal
Garfield Ditch
Lonetree Channel
Collins Creek
Kings River
Rainbow Ave
E California Ave
S Del Rey Ave
S Greenwood Ave
S Bethel Ave
E Central Ave
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0
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1
2
Miles
Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013
Live Oak Associates, Inc.
Sanger General Plan Update
Biotic Habitats and Land Uses
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virginiana), all of which are common to urban environments and likely breed and forage within the urban area for human generated food.

2.3.2 Agricultural

A large portion of the planning area consists of actively farmed agricultural land including orchards, vineyards, row crops, and grain. Common non-native grasses and forbs found in agricultural fields in the Sanger area include Canadian horseweed, prickly lettuce, slender wild oats (*Avena barbata*), foxtail barley, Russian thistle (*Salsola tragus*), shepherd's purse (*Capsella bursa-pastoris*), and stinging nettle (*Urtica dioica*).

Compared to natural habitats, managed agricultural lands provide relatively low habitat value for wildlife due to intensive management practices and lack of vegetative diversity. Annual management practices such as discing and harvesting would eliminate breeding and foraging habitat for many birds and mammals native to the region. The application of chemical pesticides may also pose a threat to such species at various times of the year.

Although none were observed, reptiles may potentially occur in the agricultural fields. The sparse cover described above, the likelihood of rodent burrows to occur in this habitat, and the presence of fluctuating populations of invertebrate and rodent prey make the site suitable for at least one native species of lizard, the western fence lizard, and several species of snake, including the gopher snake (*Pituophis catenifer catenifer*) and California kingsnake (*Lampropeltis getulus californiae*).

Common resident avian species known to forage in agricultural fields in the Sanger area include the northern mockingbird, European starling (*Sturnus vulgaris*), western meadowlark (*Sturnella neglecta*), red-tailed hawk, northern harrier (*Circus cyaneus*), killdeer (*Charadrius vociferus*), and American crow. Winter migrants may include the ferruginous hawk (*Buteo regalis*), yellow-rumped warbler (*Setophaga coronata*), and white-crowned sparrow (*Zonotrichia leucophrys*). Wheat fields in the San Joaquin Valley are commonly used for nesting by red-winged blackbirds (*Agelaius phoeniceus*), and may also be used by tricolored blackbirds (*Agelaius tricolor*) a candidate for listing under the California Endangered Species Act. Orchards may be used for nesting by American robins, mourning doves, and Anna's hummingbirds (*Calypte anna*), among other species.

Small mammals occur in agricultural lands such as those of the planning area, but populations would be highly variable depending on the crop, disturbance regime, and time of year. Freshly plowed or cultivated fields barren of vegetation provide little cover for most terrestrial vertebrates. Burrowing rodents such as California ground squirrels (*Otospermophilus beecheyi*) and Botta's pocket gophers (*Thomomys bottae*) would be more likely to occur in orchards and vineyards, where ground disturbance occurs less frequently, than in frequently tilled agricultural fields. Deer mice (*Peromyscus maniculatus*) and California voles (*Microtus californicus*) are relatively common in agricultural lands.

Mammalian predator use of the planning area's agricultural lands would be limited to disturbance-tolerant species like coyotes (*Canis latrans*) and red foxes (*Vulpes vulpes*). Various bat species, including the pallid bat (*Antrozous pallidus*) and Mexican free-tailed bat (*Tadarida brasiliensis*), may forage over the planning area's agricultural lands for flying insects.

2.3.3 Rural Developed

Outside of the urban footprint of Sanger, agricultural lands are interspersed with rural residences and several small commercial/industrial complexes. These rural developed lands include homes and other structures, landscaping, driveways and parking areas, and, in some cases, small pastures and ruderal areas adjacent to buildings. Given the scope of this investigation and the scale of the planning area, all the habitat types of each rural developed property were not delineated. Landscaping observed around many homes was extensive and often included mature non-native trees and shrubs. Horticultural species observed included conifers such as coast redwood (*Sequoia sempervirens*) and deodar cedar (*Cedrus deodora*); broad leaved trees such as sweet gum (*Liquidambar styraciflua*), fruitless mulberry (*Morus alba*), London plane trees (*Platanus acerifolia*), and European olive (*Olea europea*); and various shrubs such as oleander (*Nerium oleander*), crape myrtle (*Lagerstroemia* sp.), and low-growing junipers (*Juniperus* sp.).

Reptile use of the planning area's rural developed lands would be similar to that described for the surrounding agricultural areas. Avian species expected in rural developed lands include a mix of the same species that would be found in nearby urban and agricultural areas. Residential landscaping provides cover and nesting opportunities for resident birds such as western scrub jays, house finches (*Carpodacus mexicanus*), house sparrows, and northern mockingbirds. The cover provided by horticultural trees and shrubs can also be important to migrants passing through the area during spring and fall. Larger trees in this area provide nesting habitat for raptors such as red-tailed hawks and red-shouldered hawks (*Buteo lineatus*).

Small mammals that commonly occur in rural developed areas include California ground squirrels, deer mice, Norway rats, and house mice. Botta's pocket gophers and broad-footed moles (*Scapanus latimanus*) are regularly found in garden beds and lawns. Bats of various species may roost in residential buildings and forage overhead. Mammalian predators in this area would include the coyote, raccoon, and striped skunk (*Mephitis mephitis*).

2.3.4 Ruderal

The ruderal land use type includes disturbed habitats such as deep-ripped fields, construction sites, barren land, and travel corridors. Given the scope of this investigation and the scale of the planning area, roads were generally not mapped as ruderal habitat, but were included with adjacent land uses. Within the urban footprint of Sanger, only large expanses of ruderal land were mapped as such; small vacant lots would be expected to be functionally similar to surrounding urban development, and were therefore classified as urban.

Ruderal lands of the planning area contain no vegetation or a sparse cover of common weeds such as Bermuda grass (*Cynodon dactylon*), black mustard (*Brassica nigra*), and Russian thistle (*Salsola tragus*). Although the wildlife habitat value of ruderal lands is relatively low, these lands can support some wildlife species. Amphibians such as the Pacific tree frog and western toad (*Bufo boreas*) may disperse through ruderal lands during the winter and spring. Common reptiles such as the western fence lizard and gopher snake could potentially use ruderal habitats of the planning area. Mourning doves, northern mockingbirds, and house finches could be expected to occur on these ruderal lands, as could the disturbance-tolerant killdeer, which often nests on gravel or bare ground.

Small mammals that would be expected to occur on ruderal lands of the planning area include California ground squirrels and Botta's pocket gophers. Mammalian predators with the potential to occur on ruderal lands of the planning area include disturbance-tolerant species such as the raccoon, coyote, and Virginia opossum.

2.3.5 Non-native Grassland

Seventeen expanses of non-native grassland were identified within rural portions of the planning area. Most of these grasslands are located within the agricultural mosaic, on leveled land that was presumably once used for cultivation. Four expanses of grassland identified during the field survey are located outside of the agricultural grid. Three are associated with rural residences and appear to be in use as livestock pastures, while the fourth borders a network of basins that were once used by the City as wastewater treatment ponds. These grasslands, like all others in the planning area, appear to have been subjected to intensive disturbance over the years, and are not representative of natural grassland habitats found elsewhere in the San Joaquin Valley. Vernal pools and swales are absent from all grasslands of the planning area.

The grassland habitats of the planning area are dominated by grasses and forbs of European origin. Grass species typical of non-native grasslands in the vicinity of Sanger include ripgut brome (*Bromus diandrus*), soft chess brome (*Bromus hordeaceus*), wild oats (*Avena fatua*), and rattail fescue (*Vulpia myuros*). Common forbs associated with these grass species include red-stem filaree, broad-leaf filaree (*Erodium botrys*), and smooth cat's-ear (*Hypochaeris glabra*).

Grasslands of the planning area provide suitable habitat for a number of amphibian and reptile species. Common reptile species likely to forage and seek cover in this habitat include side-blotched lizards (*Uta stansburiana*), western whiptails (*Aspidoscelis tigris*), gopher snakes, common kingsnakes (*Lampropeltis getulus*), and western rattlesnakes (*Crotalus viridis*). Amphibian species expected to occur in the non-native grasslands of the planning area include the western toad, which could aestivate (oversummer) in rodent burrows of this habitat type.

Raptors known to utilize grassland habitats within the planning area include the red-tailed hawk and American kestrel (*Falco sparverius*). The northern harrier would also be expected in this habitat. These species prey on the reptiles and small birds and mammals of the planning area.

Other resident avian species expected in this habitat include common ravens (*Corvus corax*), mourning doves, and western meadowlarks. Spring and summer migrants that frequent these grasslands would include barn swallows (*Hirundo rustica*) and western kingbirds. Common winter migrants attracted to grasslands of the region include savannah sparrows (*Passerculus sandwichensis*), American pipits (*Anthus rebescens*), and Say's phoebes (*Sayornis saya*).

A number of small mammal species would be expected to use grasslands of the planning area, including California ground squirrels, Botta's pocket gophers, California voles, deer mice, and house mice. Large mammalian species expected to use this habitat type include the coyote and gray fox (*Urocyon cinereoargenteus*). Various species of bats would be expected to forage over the grasslands.

2.3.6 Drainages/Canals

This habitat consists of natural drainages, engineered canals and ditches, and associated riparian habitat. The two natural drainages of the planning area are the Kings River and Collins Creek, both of which pass through the planning area near its southeast corner, flowing generally from north to south. The Kings River is perennially inundated and follows its original, meandering course. The river is lined with riparian trees and shrubs including valley oak (*Quercus lobata*), Fremont's cottonwood (*Populus fremontii*), red willow (*Salix laevigata*), blue elderberry (*Sambucus nigra*), and tree tobacco (*Nicotiana glauca*). By contrast, Collins Creek carries seasonal flows, and within the planning area has been realigned to a relatively straight course within an engineered channel. The banks contain brushy riparian vegetation including blue elderberry and sandbar willow (*Salix exigua*), but riparian trees are generally absent, save near the creek's confluence with the Kings River. The creek's original course is evident in the Sanger Wastewater Treatment Facility, where remnant riparian woodland habitat meanders between the sprayfields 500-1,000 feet west of the engineered channel.

Five engineered canals and ditches pass through the planning area, the Fowler-Switch Canal, Centerville-Kingsburg Canal, Hansen Canal, Lonetree Channel, and Garfield Ditch. All engineered canals and ditches of the planning area flow generally from northeast to southwest, carry seasonal flows, and appear intensively maintained. Vegetation is generally sparse in the engineered canals and ditches; however, at the time of the field survey, inundated portions of the

Centerville-Kingsburg Canal, Hansen Canal, and Lonetree Channel were densely vegetated with sprangletop (*Leptochloa* sp.), Canadian horseweed, and several other species. Riparian trees including Fremont's cottonwood and valley oak occur sporadically along the Fowler-Switch Canal and Centerville-Kingsburg Canal. Most of the canals and ditches of the planning area have earthen beds and banks. The Centerville-Kingsburg Canal has a cement-lined bed with earthen banks for a portion of its reach through the planning area.

Drainages and canals of the planning area provide potential breeding habitat for amphibians such as western toads, Pacific chorus frogs, and bullfrogs (*Rana catesbiana*) during the spring. These species, in turn, would attract common garter snakes (*Thamnophis sirtalis*) and aquatic garter snakes (*Thamnophis atratus*) to forage in this habitat. Other reptiles that may utilize this habitat include the western fence lizard and Gilbert skink (*Eumeces gilberti*).

The presence of amphibians may attract wading birds such as the great egret (*Ardea alba*) and great blue heron (*Ardea herodias*). Dabbling ducks such as the mallard (*Anas platyrhynchos*) would be attracted to areas of still water. A number of avian species may forage and breed in the riparian corridor along the Kings River and remnant riparian areas marking the original channel of Collins Creek. These include songbirds such as the western scrub jay, house finch, and spotted towhee (*Pipilo maculatus*), woodpeckers such as the northern flicker (*Colaptes auratus*) and Nuttall's woodpecker (*Picoides nuttallii*), and game birds such as the mourning dove and California quail (*Callipepla californica*). Raptors such as the red-tailed hawk and red-shouldered hawk would nest in riparian trees in these areas.

Riparian habitat often facilitates the movement and persistence of small and large mammal populations. Muskrats (*Ondatra zibethicus*) may inhabit aquatic habitat and creek banks within the riparian zone, and raccoons commonly forage along watercourses. A number of bat species frequently forage over aquatic areas. Larger mammal species such as the gray fox and coyote may drink from and forage in these areas.

2.3.7 Artificial Ponds and Basins

Artificial ponds and basins in the planning area include stormwater detention basins, tailwater basins, residential ponds, and waste treatment ponds. Waste treatment ponds comprise five actively used ponds within the Sanger Wastewater Treatment Facility, as well as a number of basins in the City-owned natural area near the confluence of Collins Creek and the Kings River that were previously used for this purpose, but are now retired. While larger ponds and basins have been identified in Figure 3, small ponds within rural residential areas were not mapped given the scope of this investigation.

Vegetation characteristics within these areas are variable and dependent on the depth of the feature, the function of the feature, as well as the inundation and maintenance regimes. Vegetation communities associated with ponds and basins within the planning area consist of riparian vegetation described in Section 2.3.6 as well as wetland vegetation. Wetland vegetation associated with some ponds and lakes may include broadleaf cattail (*Typha latifolia*), tall flatsedge (*Cyperus eragrostis*), knotweed (*Persicaria lapathifolia*), and barnyard grass (*Echinochloa crus-gali*).

Various species of fish could use this habitat. Largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), green sunfish (*Lepomis cyanellus*), and mosquito fish (*Gambusia affinis*) are commonly found in similar aquatic habitats throughout California. The margins of artificial lakes and basins provide habitat for various amphibian and reptile species. Pacific chorus frogs, bullfrogs, and western toads would breed in such places, especially where emergent vegetation provides cover for both young and adults. These species would in turn attract common garter snakes and aquatic garter snakes to forage in this habitat.

Ponds and basins also provide habitat for a number of avian species. Great egrets and great blue herons may occasionally forage along the shallows of the shoreline for the various fish and amphibian species mentioned above. A variety of waterbirds such as greater yellowlegs (*Tringa melanolueca*), black-necked stilt (*Himantopis mexicanus*), American coot (*Fulica americana*), ruddy duck (*Oxyara jamaicensis*), northern shoveler (*Anas clypeata*), and mallard are expected to use this habitat within the planning area. Other avian species expected in this habitat include the black phoebe (*Sayornis nigricans*), which often forages over the water's edge, and the barn swallow and cliff swallow (*Petrochelidon pyrrhonota*), both of which forage over open water.

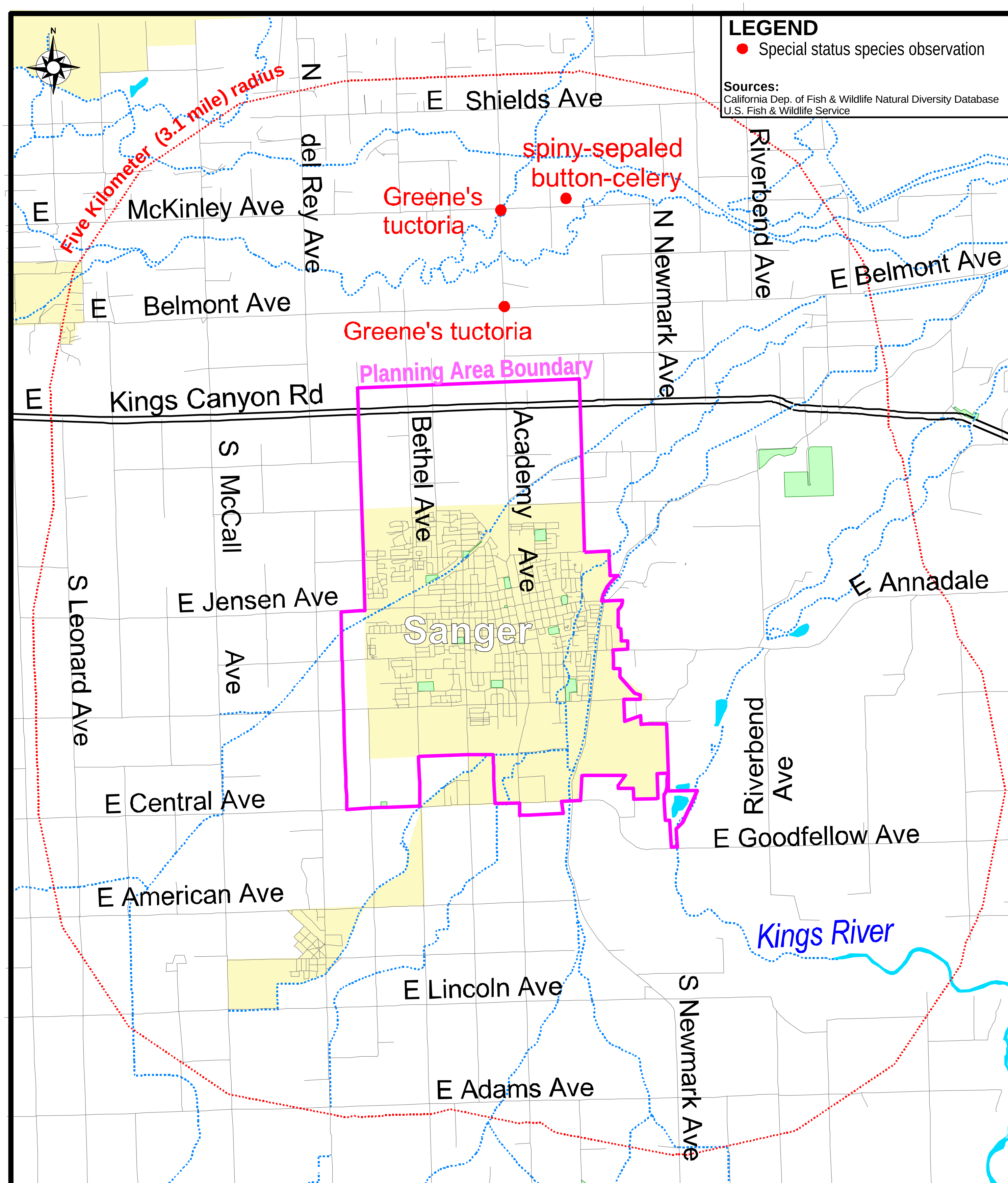
Relatively few mammals are found in such habitats, but several species may come here to drink and occasionally forage along the shallow portions of the shoreline. Muskrats often inhabit perennial aquatic habitat itself, and raccoons commonly forage along the shore. A number of bat species probably forage over these areas at various times of year.

2.4 SPECIAL STATUS PLANTS AND ANIMALS

Several species of plants and animals within the state of California have low populations and/or limited distributions. Such species may be considered "rare" and are vulnerable to extirpation as the state's human population grows and the habitats these species occupy are converted to agricultural and urban uses. As described more fully in Section 3.2, state and federal laws have provided the California Department of Fish and Wildlife (CDFW) and the U.S. Fish and Wildlife Service (USFWS) with a mechanism for conserving and protecting the diversity of plant and animal species native to the state. A sizable number of native plants and animals have been formally designated as "threatened" or "endangered" under state and federal endangered species legislation. Others have been designated as candidates for such listing. Still others have been designated as "species of special concern" by the CDFW. The California Native Plant Society (CNPS) has developed its own set of lists of native plants considered rare, threatened, or endangered (CNPS 2016). Collectively, these plants and animals are referred to as "special status species."

The *California Natural Diversity Data Base* (CDFW 2016a) was queried for special status species occurrences in the nine USGS 7.5-minute quadrangles containing and surrounding the planning area (*Sanger*, *Clovis*, *Round Mountain*, *Piedra*, *Wahtoke*, *Reedley*, *Selma*, *Conejo*, and *Malaga*). These species, and their potential to occur within the planning area, are listed in Table 2 on the following pages. Sources of information for this table included *California's Wildlife, Volumes I, II, and III* (Zeiner et. al 1988-1990), *Special Animals* (CDFW 2016b), *Special Vascular Plants, Bryophytes, and Lichens* (CDFW 2016c), and *The California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California* (CNPS 2016).

Special status species occurrences within 3.1 miles (5 kilometers) of the planning area are depicted in Figure 4, and San Joaquin kit fox (*Vulpes macrotis mutica*) occurrences within 10 miles of the planning area are depicted in Figure 5.



Live Oak Associates, Inc.

Sanger General Plan Update

Special-status Species

Date	Project #	Figure #
2/2/2016	1968-01	4

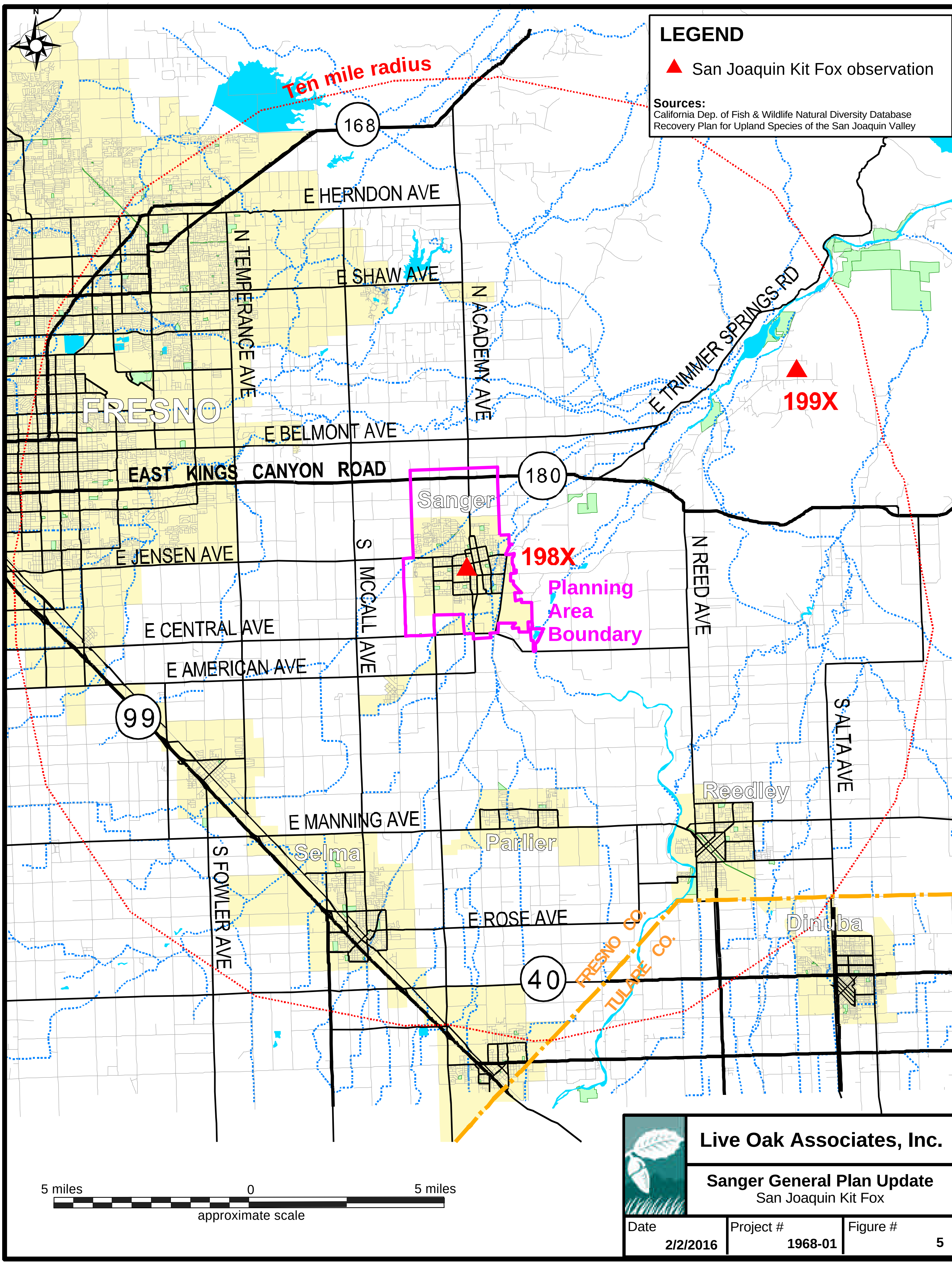

LEGEND
San Joaquin Kit Fox observation
Sources:
California Dep. of Fish & Wildlife Natural Diversity Database
Recovery Plan for Upland Species of the San Joaquin Valley
Ten mile radius
168
E HERNDON AVE
E SHAW AVE
N TEMPERANCE AVE
N ACADEMY AVE
E TRIMMER SPRINGS RD
199X
FRESNO
E BELMONT AVE
EAST KINGS CANYON ROAD
180
Sanger
198X
Planning
Area
Boundary
E JENSEN AVE
S MCCALL AVE
N REED AVE
E CENTRAL AVE
E AMERICAN AVE
99
S ALTA AVE
Reedley
E MANNING AVE
Parlier
Selma
S FOWLER AVE
E ROSE AVE
Dinuba
FRESNO CO.
TULARE CO.
40
5 miles
0
5 miles
approximate scale
Live Oak Associates, Inc.
Sanger General Plan Update
San Joaquin Kit Fox
Date
2/2/2016
Project #
1968-01
Figure #
5

TABLE 2. LIST OF SPECIAL STATUS SPECIES THAT OCCUR OR MAY OCCUR IN THE VICINITY OF THE PLANNING AREA.

PLANTS (adapted from CDFW 2016a and CNPS 2016)

Species Listed as Threatened or Endangered

Species	Status	Habitat	Occurrence in the Planning Area
Succulent Owl's Clover (*Castilleja campestris succulenta*)	FT, CE CNPS 1B	Occurs in vernal pools of the Central Valley, often in acidic soils; blooms April-May; elevation 160-2,460 ft.	**Absent.** Vernal pools are absent from the planning area.
California Jewel-flower (*Caulanthus californicus*)	FE, CE, CNPS 1B	Occurs in chenopod scrub, pinyon and juniper woodland, and sandy valley and foothill grassland; blooms February–May; elevation 250-3,300 ft.	**Unlikely.** All grassland habitats of the planning area are disturbed and would be marginal, at best, for this species. Moreover, California jewel-flower populations in the Fresno area are presumed extirpated.
San JoaquinValley Orcutt Grass (*Orcuttia inaequalis*)	FE, CE CNPS 1B	Occurs in the Central Valley in deep vernal pools with prolonged inundation; blooms April-September; elevation 100-2480 ft.	**Absent.** Vernal pools are absent from the planning area.
San Joaquin Adobe Sunburst (*Pseudobahia peirsonii)*	FT, CE, CNPS 1B	Occurs in grasslands of the Sierra Nevada foothills in heavy clay soils of the Porterville and Centerville series; blooms March-April; elevation 300-2,625 ft.	**Absent.** Suitable heavy clay soils are absent from the planning area.
Keck's Checkerbloom (*Sidalcea keckii*)	FE CNPS 1B	Occurs in blue oak woodland and valley and foothill grassland habitats in clay or serpentine soils; blooms April-June; elevation 250-2150 ft.	**Absent.** Blue oak woodland habitat is absent from the planning area, and grassland habitats are marginal, at best, due to past and ongoing human disturbance. The nearest known occurrences are 10-11 miles northeast of the planning area in large blocks of grassland / blue oak woodland habitat.
Greene's Tuctoria (*Tuctoria greenei)*	FE, CR, CNPS 1B	Occurs in vernal pools of the Central Valley; blooms May-September; elevation 100-3510 ft.	**Absent.** Vernal pools are absent from the planning area.

CNPS Listed Plants

Spiny-sepaled Button Celery (*Eryngium spinosepalum)*	CNPS 1B	Occurs in vernal pools and valley and foothill grasslands of the San Joaquin Valley and the Tulare Basin; blooms April-May; elevation 330-840 ft.	**Unlikely.** Vernal pools are absent from the planning area, and all grassland habitats would be marginal, at best, for this species due to past and ongoing human disturbance.
Forked Hare-leaf (*Lagophylla dichotoma*)	CNPS 1B	Occurs in cismontane woodland and valley and foothill grasslands; blooms April-Sept.; elevation 160-2500 ft.	**Unlikely.** Grassland habitats of the planning area would be marginal, at best, for this species due to past and ongoing human disturbance.
Madera Leptosiphon (*Leptosiphon serrulatus*)	CNPS 1B	Occurs in cismontane woodland, foothill grasslands, and lower montane forest; blooms April-May; elevation 1,000-4,300ft.	**Unlikely.** Grassland habitats of the planning area would be marginal, at best, for this species due to past and ongoing human disturbance. Moreover, the planning area is located below this species' typical elevational range.
Sanford's Arrowhead (*Sagittaria sanfordii*)	CNPS 1B	Occurs in freshwater marshes, swamps, and occasionally irrigation ditches; blooms May-October; elevation up to 2000 ft.	**Possible.** Several documented occurrences of this species are reported in canals, ditches, and detention basins in and around the Fresno/Clovis area.

TABLE 2. LIST OF SPECIAL STATUS SPECIES THAT OCCUR OR MAY OCCUR IN THE VICINITY OF THE PLANNING AREA.

PLANTS (cont'd)

CNPS Listed Plants

Species	Status	Habitat	Occurrence in the Planning Area
California Satintail (*Imperata brevifolia*)	CNPS 2B	This perennial grass occurs in chaparral, coastal sage scrub, creosote bush scrub, and wetland/riparian habitats; blooms September-May; elevation 600-4,000 ft.	**Absent.** The planning area is situated below the lower elevational limit for this species.
Caper-fruited Tropidocarpum (*Tropidocarpum capparideum*)	CNPS 1B	Occurs in valley and foothill grassland habitats; blooms March-April; elevation up to 1,500 ft.	**Unlikely.** Grassland habitats of the planning area would be marginal, at best, for this species due to past and ongoing human disturbance. Moreover, populations of this species in the Fresno area are believed to be extirpated.

ANIMALS (adapted from CDFW 2016a)

Species Listed as Threatened or Endangered Under the Federal or State Endangered Species Acts

Vernal Pool Fairy Shrimp (*Branchinecta lynchi*)	FT	Occurs in vernal pools, grass or mud-bottomed swales, and basalt depression pools.	**Absent.** Vernal pools are absent from the planning area.
Valley Elderberry Longhorn Beetle (VELB) (*Desmocerus californicus dimorphus*)	FT	Lives in mature elderberry shrubs of California's Central Valley and Sierra foothills.	**Absent.** The USFWS recently determined that the range of this species excludes most of the San Joaquin Valley, including Madera, Fresno, Kings, Tulare, and Kern Counties.
California Tiger Salamander (CTS) (*Ambystoma californiense*)	FT, CT	Found primarily in annual grasslands; requires vernal pools for breeding and rodent burrows for aestivation. May aestivate up to 1.3 miles away from breeding habitat.	**Unlikely.** Vernal pools and other suitable breeding ponds are absent from the planning area, and most grassland habitat of the site occurs within the agricultural mosaic on leveled land that was presumably once in cultivation. The few areas of grassland located outside of the agricultural mosaic are highly disturbed. Overall, the land uses and disturbance regimes of the planning area are not compatible with CTS life history and habitat requirements. The closest known occurrences of this species are located more than 4 miles to the northeast of the planning area in contiguous grassland with vernal pools.
Swainson's Hawk (*Buteo swainsoni*)	CT	This breeding-season migrant to California nests in mature trees in riparian areas and oak savannah, and occasionally in lone trees at the margins of agricultural fields. Requires adjacent foraging areas such as grasslands or alfalfa fields supporting rodent populations.	**Possible.** Agricultural fields and grasslands outside of urban Sanger provide suitable foraging habitat for this species, and mature trees in less developed areas offer suitable nesting habitat. The closest documented nesting occurrences of this species are located more than 10 miles from the planning area, however.

TABLE 2. LIST OF SPECIAL STATUS SPECIES THAT OCCUR OR MAY OCCUR IN THE VICINITY OF THE PLANNING AREA.

ANIMALS (cont'd)

Species Listed as Threatened or Endangered Under the Federal or State Endangered Species Acts

Species	Status	Habitat	Occurrence in the Planning Area
Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*)	FC, CE	Once a common breeding species in riparian habitats of lowland California, this bird today breeds consistently in only two California localities: along the Sacramento and South Fork Kern Rivers.	**Absent.** This species is believed to have been extirpated from the area.
Least Bell's Vireo (*Vireo bellii pusillus*)	FE, CE	Breeding migrant to California; current breeding distribution extends from Santa Clara County to the north and San Diego County to the south. Nests in early- to mid-successional riparian habitats.	**Unlikely.** Riparian habitats associated with Collins Creek and the Kings River are suitable for nesting by this species; however, this species has not been observed in the area for over 100 years.
Tricolored Blackbird (*Agelaius tricolor*)	CCE	Nests colonially near fresh water in dense cattails or tules, or in thickets of willows or shrubs. Forages in grassland and cropland areas.	**Possible.** Tricolored blackbirds could potentially forage in agricultural lands of the planning area, and nest in riparian habitats associated with Collins Creek and the Kings River, and possibly also wheat fields. The closest known occurrence of this species is approximately 4 miles northeast of the planning area.
San Joaquin Kit Fox (*Vulpes macrotis mutica)*	FE, CT	Found in desert alkali scrub and annual grasslands; may forage in adjacent agricultural habitats. Use underground dens for thermoregulation, cover, and reproduction. Dens are either self-dug or modified rodent burrows.	**Unlikely.** The CNDDB lists two kit fox occurrences within 10 miles of the planning area, including one mapped generally to the center of Sanger in the 1980s. However, intensive land uses of the planning area and surrounding lands are generally not compatible with kit fox life history and habitat requirements, and the planning area is located more than 50 miles from the nearest kit fox core population. This species is therefore considered unlikely to occur within the planning area.

State Species of Special Concern or Fully Protected

Western Spadefoot (*Spea hammondii*)	CSC	Mainly occurs in grasslands of San Joaquin Valley. Vernal pools or other temporary wetlands are required for breeding. Aestivates in underground refugia such as rodent burrows, typically within 1,200 ft. of aquatic habitat.	**Unlikely.** Vernal pools and other suitable breeding ponds are absent from the planning area, and most grassland habitat of the site occurs within the agricultural mosaic on leveled land that was presumably once in cultivation. The few areas of grassland located outside of the agricultural mosaic are highly disturbed. Overall, the land uses and disturbance regimes of the planning area are not compatible with spadefoot life history and habitat requirements. The closest known occurrence of this species is located approximately 5 miles northeast of the planning area in contiguous grassland.

TABLE 2. LIST OF SPECIAL STATUS SPECIES THAT OCCUR OR MAY OCCUR IN THE VICINITY OF THE PLANNING AREA.

ANIMALS (cont'd)

State Species of Special Concern or Fully Protected

Species	**Status**	**Habitat**	**Occurrence in the Planning Area**
Western Pond Turtle (*Actinemys marmorata*)	CSC	Occurs in open, slow-moving water or ponds with rocks and logs for basking. Nesting occurs in open areas, on a variety of soil types, and up to ¼ mile away from water.	**Likely.** This species may occur in natural or constructed aquatic environments within the planning area.
Northern Harrier (*Circus cyaneus*)	CSC	Frequents meadows, grasslands, open rangelands, freshwater emergent wetlands. Nests on ground, generally in wet areas, although grassland, pasture, and cultivated fields may be used.	**Possible.** This species could forage in agricultural fields and grasslands of the planning area. The planning area does not contain wetlands or marshes offering high-quality nest habitat for this species; however, grasslands and agricultural fields of the planning area could theoretically be used.
White-Tailed Kite (*Elanus leucurus*)	CFP	Occurs in savanna, open woodlands, marshes, desert grassland, and cultivated fields. Prefer lightly grazed or ungrazed fields for foraging.	**Possible.** Agricultural fields and grasslands outside of urban Sanger provide suitable foraging habitat for this species, and mature trees in less developed areas offer suitable nesting habitat.
Burrowing Owl (*Athene cunicularia*)	CSC	Frequents open, dry annual or perennial grasslands, deserts, and scrublands characterized by low growing vegetation. Dependent upon burrowing mammals, most notably the California ground squirrel, for nest burrows.	**Possible.** Burrowing owls could theoretically nest and roost in grassland and ruderal habitats of the planning area in which California ground squirrel burrows are present, and forage in these habitats or adjacent agricultural lands. However, most habitats of the planning area are marginal, at best, for this species due to past and ongoing human disturbance. There are no known occurrences of burrowing owl in the near vicinity of the planning area; the closest is nearly 6 miles northeast of the planning area in a large expanse of contiguous grassland.
Long-eared Owl (*Asio otus*)	CSC	Frequents riparian woodlands and forests of California.	**Possible.** Possible nesting and roosting habitat is present in riparian trees associated with Collins Creek and the Kings River.
Loggerhead Shrike (*Lanius ludovicianus)*	CSC	Frequents open habitats with sparse shrubs and trees, other suitable perches, bare ground, and low herbaceous cover. Nests in riparian areas, desert scrub, and agricultural hedgerows.	**Possible.** Loggerhead shrikes could nest in riparian vegetation along the Kings River and Collins Creek, and forage in grassland and agricultural habitats in rural portions of the planning area.
Pallid Bat (*Antrozous pallidus*)	CSC	Found in grasslands, chaparral, and woodlands, where it feeds on ground- and vegetation-dwelling arthropods, and occasionally takes insects in flight. Prefers to roost in rock crevices, but may also use tree cavities, caves, bridges, and buildings.	**Possible.** Grasslands and riparian habitats of the planning area are suitable for foraging by this species, and potential roosting may occur in rural portions of the planning area in the hollows of large trees, bridges, and buildings.

TABLE 2. LIST OF SPECIAL STATUS SPECIES THAT OCCUR OR MAY OCCUR IN THE VICINITY OF THE PLANNING AREA.

ANIMALS (cont'd)

State Species of Special Concern or Fully Protected

Species	Status	Habitat	Occurrence in the Planning Area
Western Mastiff Bat (*Eumops perotis)*	CSC	Found in open, arid to semi-arid habitats, where it feeds on insects in flight. Roosts most often in crevices in cliff faces, but may also use high buildings, bridges, and tunnels.	**Possible.** This species may forage over the planning area's open habitats, and may roost in bridges or buildings in rural portions of the planning area.
Townsend's Big-eared Bat (*Corynorhinus townsendii*)	CCT, CSC	Found throughout California. Primarily a cave-dwelling species, but may also roost in tunnels, buildings, other human-made structures, and hollow trees.	**Possible.** This species could roost in bridges, buildings, or large trees in rural portions of the planning area, and forage over agricultural lands or riparian habitats. There are no documented occurrences of this species within 10 miles of the planning area.
American Badger (*Taxidea taxus)*	CSC	Uncommon resident statewide; most abundant in drier open stages of most shrub, forest, and herbaceous habitats.	**Possible.** Badgers could potentially den and forage in rural grassland and ruderal habitats of the planning area. The closest occurrence of this species was documented approximately 7 miles to the northwest in 1987, in what was at that time the residential outskirts of Clovis.

Occurrence Terminology:

Present:	Species observed on the site at time of field surveys or during recent past.
Likely:	Species not observed on the site, but it may reasonably be expected to occur there on a regular basis.
Possible:	Species not observed on the site, but it could occur there from time to time.
Unlikely:	Species not observed on the site, and would not be expected to occur there except, perhaps, as a transient.
Absent:	Species not observed on the site, and precluded from occurring there because habitat requirements not met.

STATUS CODES

FE	Federally Endangered	CE	California Endangered
FT	Federally Threatened	CT	California Threatened
FPE	Federally Endangered (Proposed)	CCT	California Threatened (Candidate)
FPT	Federally Threatened (Proposed)	CFP	California Fully Protected
FC	Federal Candidate	CSC	California Species of Special Concern

CNPS	California Native Plant Society Listing		
1A	Plants Presumed Extinct in California	2	Plants Rare, Threatened, or Endangered in California, but more common elsewhere
1B	Plants Rare, Threatened, or Endangered in California and elsewhere		

2.5 ENDANGERED, THREATENED, OR SPECIAL STATUS PLANT AND ANIMAL SPECIES MERITING FURTHER DISCUSSION

2.5.1 California Tiger Salamander and Western Spadefoot

Ecology of the species. The California tiger salamander (CTS) (*Ambystoma californiense*) is listed as state and federally threatened. The CTS occurs in areas within Madera and Fresno Counties where vernal pool complexes are located within extensive grassland habitats. Vernal pools that hold water for 3-4 months of the winter and spring provide likely breeding habitat for the CTS. The CTS larvae mature in these vernal pools as they begin to dry in April and May. The young adult CTS leave the drying pools to find the burrows of California ground squirrels and pocket gophers in which to aestivate (oversummer). While CTS may wander a mile or more from the biological evaluation breeding habitat in search of aestivation habitat, studies of CTS aestivation indicate that 95% of all postbreeding adult salamanders aestivate within 0.4 mile of breeding habitat (Trenham and Shaffer 2005).

The western spadefoot (*Spea hammondii*) was historically found in California throughout the Central Valley, in the Coast Ranges and coastal lowlands from San Francisco Bay to Mexico. This species has been extirpated from many historic locations due to loss of the habitat it requires—vernal pools associated with chaparral, short grass plains, and coastal sage scrub—and is now listed as a California Species of Special Concern.

The western spadefoot typically breeds between January and May in seasonal ponds occurring in chaparral, short grass plains or coastal sage scrub. For the larvae to survive, development must be complete before the ponds dry. Mostly active at night, the spadefoot has adapted to digging in sandy soils and finding refugia in small mammal burrows, creating aestivation habitat that protects it from hot, arid daytime conditions. This species may be inactive for periods of eight to nine months, and may not reach maturity for two years. Little is known about the distance that the western spadefoot ranges from aquatic habitat for dispersal and aestivation, but current research suggests the species typically remains within 1,200 feet of aquatic habitat (Semlitsch and Brodie 2003).

Potential to occur onsite. The planning area encompasses a mosaic of agricultural, urban, and rural residential land uses generally not compatible with CTS or western spadefoot life history and habitat requirements. However, these species could theoretically occur within the planning area if suitable breeding and aestivation habitat were present. Rodent burrows of the planning area offer potential aestivation habitat for the CTS and western spadefoot; these were most frequently observed during the field survey in ruderal areas, on the banks of canals and basins, and in grasslands used as pastures.

In order for CTS or western spadefoot to utilize rodent burrows of the planning area for aestivation, they would have to be breeding nearby, and would need relatively unimpeded access to the planning area. As reported in Table 2, vernal pools are absent from the planning area. A number of artificial ponds and basins are present, but none appear to have an inundation regime that would support breeding by the CTS or western spadefoot, and those ponds that are permanently inundated are expected to be unsuitable due to the presence of bullfrogs and other predators. Lands surrounding the planning area within the 1.3-mile maximum distance that CTS have been documented from breeding habitat (Orloff 2011) comprise a mixture of intensive agricultural and rural residential uses, and do not appear to include any remnant grassland habitats within which CTS or spadefoot would be likely to have persisted. Although these lands were not surveyed, it is anticipated that any ponds or basins occurring within would be functionally similar to those of the planning area and therefore unsuitable as breeding habitat for CTS and spadefoot. In the unlikely event that individuals of either of these species were present in a basin or pond within 1.3 miles of the planning area, they would have to cross a number of barriers in order to access potential aestivation habitat in the planning area, including agricultural fields, orchards, vineyards, roads, canals, and/or the Kings River. Given the absence of suitable breeding habitat from the planning area, the presumed absence of breeding habitat and abundance of landscape barriers on surrounding lands, and the general unsuitability of agricultural and residential uses for CTS and spadefoot, these species are highly unlikely to occur within the planning area.

2.5.2 Western Pond Turtle

Ecology of the species. The western pond turtle (*Actinemys marmorata*) is the only native aquatic, freshwater turtle in California. It normally associates with permanent or nearly permanent aquatic habitats, including streams, lakes, and ponds. Historically, this species occurred in Pacific Coast drainages from Washington to Mexico. This species occurs in aquatic habitats with 1) basking sites such as rocks and logs, 2) dense stands of submergent or emergent vegetation, 3) abundant aquatic invertebrate resources, 4) suitable nearby nesting sites, and 5) a lack of native and exotic predators (Bury 1972; Jennings and Hayes 1994).

The western pond turtle nests during the summer in open, sunny areas adjacent to water. It may sometimes nest in grazed pastures. Nesting generally occurs 100 meters (384 ft.) or less from suitable aquatic habitat (Jennings and Hayes 1994). Eggs hatch in the fall, at which point hatchlings may either emerge and disperse to aquatic habitat, or overwinter in the nest and disperse the following spring. Western pond turtle juveniles in the project vicinity typically emerge upon hatching (M. Jennings, personal communication). Hatchlings and juveniles are preyed upon by bullfrogs, fish, garter snakes, wading birds, and some mammals.

Potential to occur onsite. The Kings River, other vegetated creeks and canals, and various artificial ponds of the planning area offer suitable habitat for this species. Western pond turtles may nest in non-native grassland habitats adjoining drainages and ponds of the planning area.

2.5.3 Swainson's Hawk

Ecology of the species. The Swainson's hawk *(Buteo swainsoni*) is a large, long-winged, broad-tailed hawk with a high degree of mate and territorial fidelity. It is a breeding season resident of California, arriving at nesting sites in March or April. The young hatch sometime between March and July and fledge 4 to 6 weeks later. By October, most birds have left for wintering grounds in South America. In the Central Valley, Swainson's hawks typically nest in large trees along riparian systems, but may also nest in oak groves, lone trees, trees in agricultural fields, and mature roadside trees. Nest sites are typically located adjacent to suitable foraging habitat. Swainson's hawks forage in large, open fields with abundant prey, including grasslands or lightly grazed pastures, alfalfa and other hay crops, and certain grain and row croplands. Their designation as a California Threatened species is based on population decline due in part to loss of foraging habitat to urban development (CDFG 1994).

Potential to occur onsite. As reported in Table 2, the CNDDB does not list any nesting occurrences of the Swainson's hawk in the vicinity of the planning area; the nearest such occurrence is over 10 miles away. However, Swainson's hawks are becoming increasingly common within the Central Valley and have been observed in grassland and agricultural habitats adjacent to the Fresno/Clovis Metropolitan Area numerous times in recent years by LOA biologists. It is therefore possible that Swainson's hawks use, or will at some point in the future use, mature trees in rural portions of the planning area for nesting, and agricultural fields and grassland habitats of the planning area for foraging.

2.5.4 Burrowing Owl

Ecology of the species. The burrowing owl (*Athene cunicularia*) is primarily a grassland species, but may also occur in open shrub lands, grazed pastures, and occasionally agricultural lands. The primary indicators of suitable habitat appear to be burrows for roosting and nesting and relatively short vegetation, with only sparse areas of shrubs or taller vegetation. Burrowing owls roost and nest in the burrows of California ground squirrels, and occasionally also badger, coyote, or fox. The burrowing owl diet includes a broad array of arthropods, small rodents, birds, reptiles, and amphibians. The burrowing owl was designated a California Species of Special Concern in 1978 following long-term population decline, primarily due to loss of habitat to development and agricultural practices.

Potential to occur onsite. Burrowing owls could potentially occur in rural portions of the planning area, nesting and roosting in grassland or ruderal habitats, and foraging in agricultural fields. However, the mosaic of intensive agricultural and residential uses dominating the rural outskirts of Sanger are generally not favorable for the burrowing owl, and the CNDDB does not list any burrowing owl occurrences in the vicinity of the planning area. The closest known occurrence is nearly 6 miles northeast of the planning area in a large expanse of contiguous grassland (CDFW 2016a).

2.5.5 San Joaquin Kit Fox

Ecology of the species. By the time the San Joaquin kit fox (SJKF) (*Vulpes macrotis mutica*) was listed as federally endangered in 1967 and California threatened in 1971, it had been extirpated from much of its historic range. The smallest North American member of the dog family (Canidae), the kit fox historically occupied the dry plains of the San Joaquin Valley, from San Joaquin County to southern Kern County (Grinnell et al. 1937). Local surveys, research projects, and incidental sightings indicate that kit fox currently occupy available habitat on the San Joaquin Valley floor and in the surrounding foothills. Core SJKF populations are located in the natural lands of western Kern County, the Carrizo Plain Natural Area in San Luis Obispo County, and the Ciervo-Panoche Natural Area in western Fresno and eastern San Benito Counties (USFWS 1998). A number of satellite populations are described for the San Joaquin Valley floor, including populations in western Merced and southwestern Fresno, Kings, and Tulare Counties; however, most such populations are isolated and/or declining (USFWS 2010).

The SJKF prefers habitats of open or low vegetation with loose soils. In the southern and central portion of the Central Valley, kit fox are found in valley sink scrub, valley saltbrush scrub, upper Sonoran subshrub scrub, and annual grassland (USFWS 1998). Kit fox may also be found in grazed grasslands, urban settings, and in areas adjacent to tilled or fallow fields (USFWS 1998). They require underground dens to raise pups, regulate body temperature, and avoid predators and other adverse environmental conditions (Golightly and Ohmart 1984). In the central portion of their range, they usually occupy burrows excavated by small mammals such as California ground squirrels. The SJKF is primarily carnivorous, feeding on black-tailed hares, desert cottontails, rodents, insects, reptiles, and some birds.

Potential to occur onsite. Kit fox have almost never been documented in the vicinity of Sanger. The CNDDB lists two occurrences of SJKF within ten miles of the planning area. One was mapped generally to Sanger in the 1980s, and the other was mapped approximately 8 miles northeast of the planning area, on agricultural lands near Piedra, in the early 1990s. Neither occurrence record contains information as to the habitat in which the observation was made, identifying characteristics of the animal(s) observed, credentials of the individual making the observation, or even the year of the observation. The planning area is located more than 50 miles from the nearest SJKF core population in the Ciervo-Panoche region, and 40-50 miles from the nearest extant satellite populations in southwestern Fresno, Kings, and Tulare Counties. Finally, the planning area encompasses and is surrounded by a mosaic of agricultural and developed lands generally not suitable for the SJKF. For these reasons, the kit fox is considered unlikely to occur within the planning area.

2.6 SENSITIVE HABITATS

Sensitive habitats include those that are of limited distribution, distinguished by significant biological diversity, home to special status plant and animal species, or of importance in maintaining water quality or sustaining flows. Examples of sensitive habitats in the vicinity of the planning area would include vernal pools and various types of riparian forest.

The planning area supports several areas of riparian woodland associated with the Kings River and Collins Creek. In addition to being considered a sensitive habitat, riparian areas are also recognized by CDFW as having special value for a diversity of native flora and fauna. Riparian habitat, once extensive throughout the San Joaquin Valley, has been eliminated throughout much of its former range and is now relatively uncommon.

2.7 WILDLIFE MOVEMENT CORRIDORS

Many terrestrial animals need more than one biotic habitat in order to perform all of their biological activities. With increasing encroachment of humans on wildlife habitats, it has become important to establish and maintain linkages, or movement corridors, for animals to be able to access locations containing different biotic resources that are essential to maintaining their life cycles. Terrestrial animals use ridges, canyons, riparian areas, and open spaces to travel between their required habitats.

The importance of an area as a “movement corridor” depends on the species in question and its consistent use patterns. Animal movements generally can be divided into three major behavioral categories:

- Movements within a home range or territory;
- Movements during migration; and

• Movements during dispersal.

While no detailed study of animal movements has been conducted for the planning area, knowledge of the site, its habitats, and the ecology of the species potentially occurring onsite permits reasonable predictions about the types of movements occurring in the region and whether or not development of the planning area would constitute a significant impact to animal movements.

The planning area contains portions of the Kings River, Collins Creek, and riparian woodland habitat associated with these waterways. Portions of Collins Creek within the planning area have been realigned and cleared of riparian vegetation, which has resulted in a disrupted riparian corridor not conducive to use as a travel route by most wildlife species. However, the Kings River functions as an important wildlife movement corridor. A number of wildlife species are expected to make use of this corridor for regular and seasonal movements. For example, elevational migrant birds travel along the Kings River corridor between breeding grounds in the Sierra Nevada and wintering grounds in the Central Valley. North-south migrant birds may use the river corridor as a resting and/or feeding point during migration.

2.8 JURISDICTIONAL WATERS

As will be discussed in greater detail in Section 3.2.7, the U.S. Army Corps of Engineers (USACE) has regulatory authority over certain rivers, creeks, lakes, ponds, reservoirs, wetlands, and in some cases irrigation canals ("Waters of the U.S." or "jurisdictional waters"). The extent of USACE jurisdiction is defined in the Code of Federal Regulations and has been further clarified in federal courts. Generally, Waters of the U.S. are navigable waters that cross state or national boundaries, are used in or somehow influence interstate or foreign commerce, or are impoundments or tributaries of such waters. The CDFW has jurisdiction over waters in California that have a defined bed and bank, including engineered channels that replace natural drainages. The State Water Resources Control Board (SWRCB) and nine Regional Water Quality Control Boards (RWQCBs) assert jurisdiction over all surface water and groundwater in the State of California.

As discussed in previous sections, the planning area contains a number of aquatic features, including portions of the Kings River, Collins Creek, the Fowler-Switch Canal, Centerville-Kingsburg Canal, Hansen Canal, Garfield Ditch, Lonetree Channel, and many artificial ponds and basins. The Kings River and Collins Creek are known Waters of the U.S. subject to the jurisdiction of the USACE. The limit of USACE jurisdiction would be the ordinary high water (OHW) level. These two natural drainages would also be claimed by CDFW, with a limit of jurisdiction extending to the top of bank or the edge of associated riparian vegetation, whichever is greater.

The two major irrigation canals of the planning area—Fowler-Switch Canal and Centerville-Kingsburg Canal—originate at the Kings River via the Consolidated Canal. The smaller canals and ditches of the planning area—Hansen Canal, Garfield Ditch, and Lonetree Channel—originate at the Kings River via the Gould, Enterprise, and Fresno Canals. Downstream connectivity of the planning area's canals and ditches could not be ascertained from analysis of aerial imagery and USGS topographical maps. All of the waterways feed other waterways, split into distributaries, are undergrounded, or some combination of the three, making it difficult to discern the ultimate path of their flows. Artificial waterways with both upstream and downstream connectivity to Waters of the U.S. are generally claimed by the USACE. Because all of the planning area's canals and ditches originate at the Kings River, any such waterways with downstream connectivity to Waters of the U.S. are likely to fall under USACE jurisdiction. Traditionally, CDFW has not claimed canals and ditches such as those found in the planning area that do not replace natural drainages or support fish populations, and that lack riparian habitat.

Artificial ponds and basins adjacent to or hydrologically connected to jurisdictional drainages and canals may, themselves, be considered jurisdictional by the USACE. CDFW would be expected to claim jurisdiction over constructed ponds that support aquatic life and/or riparian vegetation. With limited access to private lands in the planning area, it was not possible to determine which of the artificial ponds and basins of the planning area meet these criteria.

All aquatic features of the planning area, including natural drainages, irrigation canals and ditches, and artificial ponds and basins, are Waters of the State subject to the regulatory authority of the Central Valley RWQCB.

2.9 DESIGNATED CRITICAL HABITAT

The USFWS often designates areas of "critical habitat" when it lists species as threatened or endangered. Critical habitat is a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection.

Designated critical habitat is absent from the planning area. The nearest unit of critical habitat is located approximately 5 miles north of the planning area in an extensive complex of grasslands and vernal pools, and is designated for the protection of the succulent owl's-clover.

3.0 IMPACTS AND MITIGATIONS

3.1 SIGNIFICANCE CRITERIA

Approval of general plans, area plans, and specific projects is subject to the provisions of CEQA. The purpose of CEQA is to assess the impacts of proposed projects on the environment before they are carried out. CEQA is concerned with the significance of a proposed project's impacts. For example, a proposed development project may require the removal of some or all of a site's existing vegetation. Animals associated with this vegetation could be destroyed or displaced. Animals adapted to humans, roads, buildings, pets, etc., may replace those species formerly occurring on the site. Plants and animals that are state and/or federally listed as threatened or endangered may be destroyed or displaced. Sensitive habitats such as wetlands and riparian woodlands may be altered or destroyed.

Whenever possible, public agencies are required to avoid or minimize environmental impacts by implementing practical alternatives or mitigation measures. According to Section 15382 of the CEQA Guidelines, a significant effect on the environment means a "substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic interest."

Specific project impacts to biological resources may be considered "significant" if they would:

- 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 Game or U.S. Fish and Wildlife Service;

- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service;

- 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;

- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;

- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or

- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

Furthermore, CEQA Guidelines Section 15065(a) states that a project may trigger the requirement to make a "mandatory finding of significance" if the project has the potential to

> Substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of an endangered, rare or threatened species, or eliminate important examples of the major periods of California history or prehistory.

3.2 RELEVANT GOALS, POLICIES, AND LAWS

3.2.1 General Plan Policies

Cities and counties adopt general plans to guide future development and to protect and/or enhance natural and cultural resources. In general, projects must be consistent with the goals and policies of these general plans. Projects within the Sanger GPU planning area will need to conform to both the Sanger and Fresno County general plans. The Fresno County General Plan was adopted in 2000, and has a planning horizon of 15 to 25 years.

The Open Space and Conservation Element of the Fresno County General Plan includes goals concerning the conservation of wetlands and riparian areas, fish and wildlife habitats, and valuable vegetation resources. These goals are supported by numerous policies and implementation programs. Relevant policies are summarized as follows: 1) the County shall support the "no-net-loss" wetlands policies of the USACE, USFWS, and CDFW, and shall require new development to fully mitigate the loss of regulated wetlands, 2) the County shall require new development to be designed in such a manner that pollutants and siltation do not significantly degrade the area, value, or function of wetlands, 3) the County shall require new developments to preserve and enhance native riparian habitat unless public safety concerns require removal of habitat, and shall require riparian protection zones around natural watercourses, 4) the County shall identify and conserve remaining upland habitat areas adjacent to wetland and riparian areas that are critically important to wildlife species associated with those wetland and riparian areas, 5) where practicable, the County shall support efforts to avoid the "net" loss of important wildlife habitat, and should preserve in a natural state those areas defined as habitats for rare and endangered animal and plant species, 6) if loss of important habitat for special status species or other valuable wildlife resources cannot be avoided, the County shall impose adequate mitigation, 7) the County shall require adequate buffer zones between construction activities and significant wildlife resources, 8) the County shall promote methods of pest control on croplands bordering sensitive habitats that do not place special status species at risk, e.g. SJKF, 9) the County shall support the preservation of significant areas of natural vegetation, e.g. oak woodlands, riparian areas, and vernal pools, and 10) the County shall require that new developments preserve natural woodlands to the maximum extent possible.

3.2.2 Threatened and Endangered Species

In California, imperiled plants and animals may be afforded special legal protections under the California Endangered Species Act (CESA) and/or Federal Endangered Species Act (FESA). Species may be listed as "threatened" or "endangered" under one or both Acts, and/or as "rare" under CESA. Under both Acts, "endangered" means a species is in danger of extinction throughout all or a significant portion of its range, and "threatened" means a species is likely to become endangered within the foreseeable future. Under CESA, "rare" means a species may become endangered if their present environment worsens. Both Acts prohibit "take" of listed species, defined under CESA as "to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture or kill" (California Fish and Game Code, Section 86), and more broadly defined under FESA to include "harm" (16 USC, Section 1532(19), 50 CFR, Section 17.3).

When state and federally listed species have the potential to be impacted by a project, the USFWS and CDFW must be included in the CEQA process. These agencies review the environmental document to determine the adequacy of its treatment of endangered species issues and to make project-specific recommendations for the protection of listed species. Projects that may result in the "take" of listed species must generally enter into consultation with the USFWS and/or CDFW pursuant to FESA and CESA, respectively. In some cases, incidental take authorization(s) from these agencies may be required before the project can be implemented.

3.2.3 California Fully Protected Species

The classification of certain animal species as "fully protected" was the State of California's initial effort, prior to the passage of the California Endangered Species Act, to identify and protect those species that were rare or faced possible extinction. Following CESA enactment in 1970, many fully protected species were also listed as California threatened or endangered. The list of fully protected species are identified, and their protections stipulated, in California Fish and Game Code Sections 3511 (birds), 4700 (mammals), 5050 (reptiles and amphibians), and fish (5515). Fully protected species may not be taken or possessed at any time and no licenses or permits may be issued for their take, except in conjunction with necessary scientific research and protection of livestock.

3.2.4 Migratory Birds

The Federal Migratory Bird Treaty Act (FMBTA: 16 USC 703-712) prohibits killing, possessing, or trading in any bird species covered in one of four international conventions to which the United States is a party, except in accordance with regulations prescribed by the Secretary of the Interior. The name of the act is misleading, as it actually covers almost all birds native to the United States, even those that are non-migratory. The FMBTA encompasses whole birds, parts of birds, and bird nests and eggs.

Although the USFWS and its parent administration, the U.S. Department of the Interior, have traditionally interpreted the FMBTA as prohibiting incidental as well as intentional "take" of birds, a January 2018 legal opinion issued by the Department of the Interior now states that incidental take of migratory birds while engaging in otherwise lawful activities is permissible under the FMBTA. However, California Fish and Game Code makes it unlawful to take or possess any non-game bird covered by the FMBTA (Section 3513), as well as any other native non-game bird (Section 3800), even if incidental to lawful activities.

3.2.5 Birds of Prey

Birds of prey are protected in California under provisions of the Fish and Game Code (Section 3503.5), which states that it is unlawful to take, possess, or destroy any birds in the order Falconiformes (hawks and eagles) or Strigiformes (owls), as well as their nests and eggs. The bald eagle and golden eagle are afforded additional protection under the federal Bald and Golden Eagle Protection Act (16 USC 668), which makes it unlawful to kill birds or their eggs.

3.2.6 Nesting Birds

In California, protection is afforded to the nests and eggs of all birds. California Fish and Game Code (Section 3503) states that it is "unlawful to take, possess, or needlessly destroy the nest or eggs of any bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Breeding-season disturbance that causes nest abandonment and/or loss of reproductive effort is considered a form of "take" by the CDFW.

3.2.7 Wetlands and Other Jurisdictional Waters

Natural drainage channels and adjacent wetlands may be considered "waters of the United States" or "jurisdictional waters" subject to the jurisdiction of the USACE. The extent of jurisdiction has been defined in the Code of Federal Regulations but has also been subject to interpretation of the federal courts. Jurisdictional waters generally include:

- All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
- All interstate waters including interstate wetlands:
- All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce;
- All impoundments of waters otherwise defined as waters of the United States under the definition;
- Tributaries of waters identified in paragraphs (a)(1)-(4) (i.e. the bulleted items above).

As determined by the United States Supreme Court in its 2001 *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers* (SWANCC) decision, channels and wetlands isolated from other jurisdictional waters cannot be considered jurisdictional on the basis of their use, hypothetical or observed, by migratory birds. Similarly, in its 2006 consolidated *Carabell/Rapanos* decision, the U.S. Supreme Court ruled that a significant nexus between a wetland and other navigable waters must exist for the wetland itself to be considered a navigable and therefore jurisdictional water.

The USACE regulates the filling or grading of Waters of the U.S. under the authority of Section 404 of the Clean Water Act. The extent of jurisdiction within drainage channels is defined by "ordinary high water marks" on opposing channel banks. All activities that involve the discharge of dredge or fill material into Waters of the U.S. are subject to the permit requirements of the USACE. Such permits are typically issued on the condition that the applicant agrees to provide mitigation that result in no net loss of wetland functions or values. No permit can be issued until the RWQCB issues a Section 401 Water Quality Certification (or waiver of such certification) verifying that the proposed activity will meet state water quality standards.

Under the Porter-Cologne Water Quality Control Act of 1969, the State Water Resources Control Board has regulatory authority to protect the water quality of all surface water and groundwater in the State of California ("Waters of the State"). Nine RWQCBs oversee water quality at the local and regional level. The RWQCB for a given region regulates discharges of fill or pollutants into Waters of the State through the issuance of various permits and orders. Discharges into Waters of the State that are also Waters of the U.S. require a Section 401 Water Quality Certification from the RWQCB as a prerequisite to obtaining certain federal permits, such as a Section 404 Clean Water Act permit. Discharges into all Waters of the State, even those that are not also Waters of the U.S., require Waste Discharge Requirements (WDRs), or waivers of WDRs, from the RWQCB. The RWQCB also administers the Construction Storm Water Program and the federal National Pollution Discharge Elimination System (NPDES) program. Projects that disturb one or more acres of soil must obtain a Construction General Permit under the Construction Storm Water Program. A prerequisite for this permit is the development of a Storm Water Pollution Prevention Plan (SWPPP) by a certified Qualified

SWPPP Developer. Projects that discharge wastewater, storm water, or other pollutants into a Water of the U.S. may require a NPDES permit.

CDFW has jurisdiction over the bed and bank of natural drainages and lakes according to provisions of Section 1601 and 1602 of the California Fish and Game Code. Activities that may substantially modify such waters through the diversion or obstruction of their natural flow, change or use of any material from their bed or bank, or the deposition of debris require a Notification of Lake or Streambed Alteration. If CDFW determines that the activity may adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement will be prepared. Such an agreement typically stipulates that certain measures will be implemented to protect the habitat values of the lake or drainage in question.

3.3 POTENTIALLY SIGNIFICANT IMPACTS/MITIGATIONS

The Sanger GPU provides a framework for sustainable growth within a 6,900-acre planning area that, at present, contains extensive agricultural and other undeveloped land. It is assumed that, by 2035, some or all of these lands will be converted to residential, commercial, and industrial uses to accommodate projected growth.

As discussed, certain regionally-occurring special status species have the potential to occur in the planning area. However, the planning area is not uniformly suitable for such species; rather, it contains a diversity of habitats and land use types, only some of which may support special status species. In general, special status species occurrence within the planning area is expected to be limited to rural areas, and may further be influenced by the presence of certain habitat components such as grassland and riparian vegetation.

In the following discussions of potential impacts to sensitive biological resources associated with future development of the planning area, the planning area has been divided into two main zones, urban and rural. *Urban* includes all lands under significant influence of the urban environment, identified as those within the urban/rural boundary depicted in Figure 3. *Rural* includes all lands outside of the urban/rural boundary depicted in Figure 3. Impacts to specific biological resources have been evaluated for each zone. Evaluation of impacts by zones was undertaken to aid City planners in their consideration of potential impacts to sensitive or protected biological resources when considering certain areas for future projects and growth.

3.3.1 Potential Impacts to the Sanford's Arrowhead

Potential Impacts. This species may occur in slow moving creeks and earthen canals of the planning area. Future projects that impact these habitats may eliminate an as-yet-unknown population of this sensitive plant species, which would be considered a significant impact under CEQA.

Mitigation. The following mitigation measures are required for projects in either the urban or rural zone that will directly impact drainages and canals (see "Drainages/Canals" on Figure 3), save cement-lined canals.

> ***Mitigation Measure 3.3.1a (Preconstruction Surveys).*** Prior to construction activities in drainages and canals, a qualified biologist will conduct a preconstruction survey for the Sanford's arrowhead during the May-October blooming period for this species.
>
> ***Mitigation Measure 3.3.1b (Avoidance).*** If a Sanford's arrowhead population is identified within the construction zone, it will be avoided by a minimum distance of 50 feet if possible. The avoidance area will be identified on the ground with construction fencing, brightly-colored flagging, or other easily visible means.
>
> ***Mitigation Measure 3.3.1c (Salvage).*** If it is not possible to avoid populations of Sanford's arrowhead identified within construction zones, a qualified biologist will remove all individual plants to be impacted and relocate them to a suitable portion of the drainage/canal that is nearby but will not be impacted.

Implementation of the above measures will reduce potential project impacts to the Sanford's arrowhead to a less than significant level under CEQA.

3.3.2 Potential Impacts to the Western Pond Turtle

Potential Impacts. This species may occur in inundated creeks and canals in both urban and rural portions of the planning area. Within the rural zone, it also has the potential to occur in inundated ponds and basins, and to nest in grasslands adjoining suitable aquatic habitat. Projects that will directly impact these habitats have the potential to result in injury or mortality of western pond turtle individuals, which would be considered a significant impact under CEQA.

Mitigation. The following mitigation measures are required for projects that will directly impact inundated drainages or canals (see "Drainages/Canals" on Figure 3) in either the urban or rural zone, inundated ponds and basins (see "Artificial Ponds/Basins" on Figure 3) within the rural zone, and/or grassland habitats (see "Non-native Grassland" on Figure 3) within 400 feet of creeks, canals, ponds, and basins in the rural zone.

> ***Mitigation Measure 3.3.2a (Minimization).*** Construction-related disturbance of grassland habitats within 400 feet of creeks, canals, ponds, and basins in the rural zone should occur between November 1 and May 31, or outside of the annual time frame in which gravid females in the project vicinity typically seek out nest sites and lay eggs, eggs incubate, and hatchlings emerge.
>
> ***Mitigation Measure 3.3.2b (Preconstruction Surveys).*** If construction-related disturbance of grassland habitats within 400 feet of creeks, canals, ponds, and basins in the rural zone must occur between June 1 and October 31, a qualified biologist will conduct preconstruction surveys for western pond turtle nests within 30 days prior to the start of construction. The presence of turtle eggshells and/or disturbed earth will indicate the potential presence of a nest. Such areas will be carefully hand-excavated by the biologist to determine whether a nest is present.
>
> Preconstruction surveys for western pond turtles must also be conducted within 24 hours prior to the start of construction activities in inundated drainages or canals in either the urban or rural zone, and in inundated ponds or basins in the rural zone. These surveys will encompass all aquatic habitat and surrounding uplands within 100 feet that are proposed for impact. Any turtles that are discovered during the preconstruction surveys will be relocated to similar habitat outside of the impact area.
>
> ***Mitigation Measure 3.3.2c (Avoidance of Active Nests).*** If the preconstruction surveys for western pond turtle nests identify one or more active nests, a 50-foot buffer will be established around the nest(s). No construction personnel or equipment shall enter the avoidance area until after a qualified biologist has determined that the hatchlings have emerged.
>
> ***Mitigation Measure 3.3.2d (Relocation of Turtle Eggs/Hatchlings).*** If it is not possible to avoid the active pond turtle nest(s), eggs and/or hatchlings will be relocated to nearby suitable habitat in consultation with a qualified herpetologist.

Implementation of the above measures will reduce potential project impacts to the western pond turtle to a less than significant level under CEQA.

3.3.3 Potential Impacts to the Swainson's Hawk

Potential Impacts. This species has the potential to nest in mature trees in the rural zone, and to forage in the rural zone's agricultural fields and grassland habitats. Future construction activities that will remove mature trees in the rural zone have the potential to directly impact Swainson's hawk nests, in which case eggs or nestlings may be destroyed. Future construction activities that will occur in close proximity to mature trees in the rural zone have the potential to disturb nesting Swainson's hawks such that they would abandon their nests. Construction-related mortality/disturbance of nesting Swainson's hawks would be considered a significant impact under CEQA.

Although future projects in the planning area have the potential to remove agricultural fields and grassland habitats that could potentially be used for foraging by the Swainson's hawk, such activities are not expected to adversely affect individuals or populations of this species through loss of habitat. As discussed, all non-native grassland habitat of the planning area is degraded in nature, having been previously subjected to ground disturbance and likely also cultivation. Similar grassland habitat is relatively abundant in the region, as are agricultural fields. Moreover, because Swainson's hawks are uncommon in the project vicinity, agricultural fields and grassland habitats of the planning area are unlikely to represent important foraging habitat for individuals or populations of this species. No mitigation for loss of Swainson's hawk foraging habitat is warranted.

Swainson's hawks are not expected to occur in the planning area's urban zone. Impacts to the Swainson's hawk associated with future projects in the urban zone are considered less than significant under CEQA.

Mitigation. The following mitigation measures are required for future projects in the planning area's rural zone.

> ***Mitigation Measure 3.3.3a* (*Temporal Avoidance*).** In order to avoid impacts to nesting Swainson's hawks, construction activities in the rural zone will occur, where possible, outside the nesting season, typically defined as March 1-September 15.
>
> ***Mitigation Measure 3.3.3b (Preconstruction Surveys).*** If construction activities in the rural zone must occur between March 1 and September 15, a qualified biologist will

conduct preconstruction nest surveys for Swainson's hawks on and within ½ mile of the work area within 30 days prior to the start of construction. The survey will consist of inspecting all accessible, suitable trees of the survey area for the presence of nests and hawks.

Mitigation Measure 3.3.3c (Avoidance of Active Nests). Should any active Swainson's hawk nests be discovered within the survey area, an appropriate disturbance-free buffer will be established based on local conditions and agency guidelines. Disturbance-free buffers will be identified on the ground with flagging, fencing, or by other easily visible means, and will be maintained until a qualified biologist has determined that the young have fledged and are capable of foraging independently.

Implementation of the above measures will reduce potential project impacts to the Swainson's hawk to a less than significant level under CEQA, and will ensure that the project is in compliance with state laws protecting this species.

3.3.4 Potential Impacts to the Burrowing Owl

Potential Impacts. Burrowing owls have the potential to nest and roost in grassland and ruderal habitat of the rural zone, and to forage in the rural zone's grasslands and agricultural fields. If burrowing owls are nesting or roosting on site at the time of future construction activities, they could be at risk of construction-related injury or mortality. Such individuals may also be adversely affected from loss of habitat because, with all portions of the planning area subject to development under the Sanger GPU, it cannot be assumed that displaced owls would simply move to intact adjacent habitat. Project-related burrowing owl mortality and loss of occupied burrowing owl habitat would both be considered significant impacts under CEQA. Project-related mortality of burrowing owls would also violate state law.

Burrowing owls are not expected to occur in the planning area's urban zone. Impacts to the burrowing owl associated with future projects in the urban zone are considered less than significant under CEQA.

Mitigation. The following mitigation measures are required for future projects in ruderal habitat (see "Ruderal" on Figure 3) or grassland habitat (see "Non-native Grassland" on Figure 3) in the rural zone of the planning area.

Mitigation Measure 3.3.2a (Take Avoidance Survey). A preconstruction "take avoidance" survey for burrowing owls will be conducted by a qualified biologist between 14 and 30 days prior to the start of construction according to methods described in the *Staff Report on Burrowing Owl Mitigation* (CDFW 2012). The survey area will include all suitable habitat on and within 200 meters of the construction zone, where accessible.

Mitigation Measure 3.3.2b (Avoidance of Active Nests). If construction activities are undertaken during the breeding season (February 1-August 31) and active nest burrows are identified within or near the construction zone, a 200-meter disturbance-free buffer will be established around these burrows, or alternate avoidance measures implemented in consultation with CDFW. The buffers will be enclosed with temporary fencing to prevent construction equipment and workers from entering the setback area. Buffers will remain in place for the duration of the breeding season, unless otherwise arranged with CDFW. After the breeding season (i.e. once all young have left the nest), passive relocation of any remaining owls may take place as described below.

Mitigation Measure 3.3.2c (Avoidance or Passive Relocation of Resident Owls). During the non-breeding season (September 1-January 31), resident owls occupying burrows in the construction zone may either be avoided, or passively relocated to alternative habitat. If the project applicant chooses to avoid active owl burrows within the construction zone during the non-breeding season, a 50-meter disturbance-free buffer will be established around these burrows, or alternate avoidance measures implemented in consultation with CDFW. The buffers will be enclosed with temporary fencing, and will remain in place until a qualified biologist determines that the burrows are no longer active. If the project applicant chooses to passively relocate owls during the non-breeding season, this activity will be conducted in accordance with a relocation plan prepared by a qualified biologist.

Mitigation Measure 3.3.2d (Compensatory Mitigation). The project applicant will mitigate, at a 1:1 ratio, for all potential burrowing owl habitat removed within 600 meters of active burrowing owl burrows, as identified during the preconstruction surveys provided for in Mitigation Measure 3.3.2b. Potential burrowing owl habitat in the planning area generally includes agricultural fields (suitable for foraging), ruderal habitat (suitable for nesting), and non-native grassland habitat (suitable for nesting or foraging). Compensatory mitigation will entail either (1) acquiring suitable replacement habitat in the project vicinity, to be preserved in perpetuity under conservation easement and managed according to the provisions of a long-term management plan, or (2) purchasing credits at a CDFW-approved burrowing owl conservation bank.

Implementation of the above measures will reduce potential project impacts to the burrowing owl to a less than significant level under CEQA, and will ensure that the project is in compliance with state laws protecting this species.

3.3.5 Potential Impacts to the American Badger

Potential Impacts. The American badger, while uncommon in the project vicinity, has the potential to den in grassland or ruderal habitats of the rural zone, and possibly also along the rural zone's drainages and canals. Badgers could use the rural zone's grasslands and agricultural fields for foraging. If badgers are denning on site at the time of future construction activities, they could be at risk of construction-related injury or mortality, which would constitute a significant impact of the project under CEQA.

Although future projects in the planning area may result in the loss of habitat potentially suitable for the American badger, none of the planning area's habitats are expected to be of regional importance for this species because badgers are uncommon in the project vicinity, and because similar habitats are relatively abundant in the region. No mitigation for loss of American badger habitat is warranted.

American badgers are not expected to occur in the planning area's urban zone. Impacts to the American badger associated with future projects in the urban zone are considered less than significant under CEQA.

Mitigation. The following mitigation measures are required for future projects in ruderal habitat (see "Ruderal" on Figure 3), grassland habitat (see "Non-native Grassland" on Figure 3), or drainages or canals (see "Drainage/Canal" on Figure 3) in the rural zone of the planning area.

> ***Mitigation Measure 3.3.5a (Preconstruction Surveys).*** A preconstruction survey for American badgers will be conducted by a qualified biologist within 30 days of the start of construction.
>
> ***Mitigation Measure 3.3.5b (Avoidance of Natal Dens).*** Should an active natal den be identified during the preconstruction surveys, a suitable disturbance-free buffer will be established around the den and maintained until a qualified biologist has determined that the cubs have dispersed or the den has been abandoned.

Implementation of these measures will reduce potential project impacts to the American badger to a less than significant level under CEQA.

3.3.6 Potential Impacts to the Tricolored Blackbird, Northern Harrier, White-tailed Kite, Long-eared Owl, Loggerhead Shrike, and Other Nesting Migratory Birds and Raptors

Potential Impacts. In addition to the Swainson's hawk, several other special status avian species have the potential to nest and forage in the planning area's rural zone. The tricolored blackbird (*Agelaius tricolor*), a candidate for listing as endangered under the California Endangered Species Act, and the loggerhead shrike (*Lanius ludovicianus*), a California Species of Special Concern, could potentially nest in riparian habitat along Collins Creek and the Kings River. The tricolored blackbird also has some potential to nest in wheat fields of the planning area. The northern harrier, a California Species of Special Concern, could nest in non-native grassland habitat. The long-eared owl (*Asio otus*), a California Species of Special Concern, and white-tailed kite (*Elanus leucurus*), a California Fully Protected Species, both have the potential to nest in mature riparian trees along Collins Creek and the Kings River, and the white-tailed kite may also nest in mature trees in open areas. All of these species have the potential to forage in grasslands and agricultural fields of the rural zone.

All portions of the planning area have the potential to be used for nesting by common birds afforded protections under the California Fish and Game Code. For example, orchards may be used by common tree-nesting species such as the American robin and mourning dove, and wheat fields may be used by red-winged blackbirds. The western meadowlark may nest on the ground in grassland habitats of the rural zone, and the disturbance-tolerant killdeer may nest in ruderal areas of either zone. Other likely urban zone nesters include the house finch, which often nests on or around buildings, and the northern mockingbird, common in residential neighborhoods.

If future construction activities occur during the nesting season, birds nesting within the work area could be injured or killed by construction activities, while birds nesting adjacent to work areas could be disturbed such that they would abandon their nests. Activities that adversely affect the nesting success of raptors and migratory birds or result in the mortality of individual birds would be a violation of state laws, and would constitute a significant impact of the project under CEQA.

Future projects in the planning area have the potential to remove large blocks of habitat that, at present, could be used for nesting and foraging by the tricolored blackbird, northern harrier, white-tailed kite, long-eared owl, and loggerhead shrike. Loss of the planning area's non-native grassland habitat and agricultural fields is not expected to adversely affect these species because similar habitats are abundant in the region (see Section 3.3.3). However, should future projects result in extensive removal of riparian vegetation, tricolored blackbird, white-tailed kite, long-eared owl, and loggerhead shrike individuals and populations may be significantly impacted from loss of nesting habitat. Intact riparian habitat such as that found along the Kings River has become regionally scarce, having been converted to other uses or eliminated as a result of channel modifications and water diversions. Potential loss of riparian habitat suitable for nesting by the tricolored blackbird, white-tailed kite, long-eared owl, and loggerhead shrike is therefore considered a significant impact of the Sanger GPU under CEQA. Please refer to Section 3.3.9 below for required mitigation measures.

Mitigation. The following measures are required for all future projects in the planning area.

> ***Measure 3.3.6a (Construction Timing).*** If feasible, project construction will occur outside of the avian nesting season, typically defined as February 1 to August 31.
>
> ***Measure 3.3.6b (Preconstruction Surveys*).** If construction must occur between February 1 and August 31, a qualified biologist will conduct preconstruction surveys for active migratory bird nests within 14 days prior to the start of work. For projects within the urban zone, the survey area will encompass the work area and accessible surrounding lands within 100 feet. For projects within the rural zone, the survey area will encompass the work area and accessible surrounding lands within 250 feet.
>
> ***Measure 3.3.6c (Avoidance of Active Nests*).** Should any active nests be discovered within the survey area, the biologist will identify a suitable disturbance-free buffer around the nest(s). Buffers will be identified on the ground with flagging or fencing, and will be maintained until the biologist has determined that the young have fledged and are capable of foraging independently.

Implementation of the above measures will reduce potential impacts associated with construction-related mortality of nesting tricolored blackbirds, northern harriers, white-tailed kites, long-eared owls, loggerhead shrikes, and other migratory birds and raptors to a less than significant level under CEQA, and will ensure compliance with state laws protecting these species.

3.3.7 Potential Impacts to the Pallid Bat, Western Mastiff Bat, Townsend's Big-eared Bat, and Other Roosting Bats

Potential Impacts. The planning area's rural zone contains buildings, bridges, and large trees suitable for roosting by a variety of native bat species including the pallid bat, western mastiff bat (*Eumops perotis*), and Townsend's big-eared bat (*Corynorhinus townsendii*), all California Species of Special Concern. Buildings, bridges, and large trees of the urban zone, while unlikely to be used by these three special status bat species (Avila-Flores and Fenton 2005, Miner and Stokes 2005), may be used for roosting by common species such as the big brown bat (*Eptesicus fuscus*) and Brazilian free-tailed bat (*Tadarida brasiliensis*).

Future projects that remove buildings, bridges, or large trees have the potential to impact any bats roosting within. If bat maternity colonies are present, many individual bats could be killed. Such a mortality event would be considered a significant impact of the project under CEQA.

Although future development of the planning area's rural zone may result in the loss of non-native grassland and agricultural habitats that, at present, could be used for foraging by the pallid bat, western mastiff bat, and Townsend's big-eared bat, individuals and populations of these species are not expected to be adversely affected from loss of these lands because similar habitats are abundant in the region. However, extensive removal of riparian vegetation along Collins Creek and the Kings River, if it occurs, would represent a significant loss of habitat for these species because 1) it is relatively undisturbed under existing conditions, offering high-quality roosting and foraging habitat within a matrix of intensively managed lands, and 2) similar intact riparian habitat has become regionally scarce. Potential loss of riparian habitat suitable for roosting and nesting by the pallid bat, western mastiff bat, and Townsend's big-eared bat is therefore considered a significant impact under CEQA. Please refer to Section 3.3.9 below for required mitigation measures.

Mitigation. The following measures are required for all future projects in the planning area that will remove buildings, bridges, or large trees.

> ***Mitigation Measure 3.3.7a (Temporal Avoidance).*** To avoid potential impacts to maternity bat roosts, removal of buildings, bridges, and large trees should occur outside

of the period between April 1 and September 30, the time frame within which colony-nesting bats generally assemble, give birth, nurse their young, and ultimately disperse.

Mitigation Measure 3.3.7b (Preconstruction Surveys). If removal of buildings, bridges, or large trees is to occur between April 1 and September 30 (general maternity bat roost season), then within 30 days prior to their removal, a qualified biologist will survey them for the presence of bats. The biologist will look for individuals, guano, and staining, and will listen for bat vocalizations. If necessary, the biologist will wait for nighttime emergence of bats from roost sites. If no bats are observed to be roosting or breeding, then no further action would be required, and construction could proceed.

Mitigation Measure 3.3.7c (Minimization). If a non-breeding bat colony is detected during preconstruction surveys, the individuals will be humanely evicted under the direction of a qualified biologist to ensure that no harm or "take" of any bats occurs as a result of construction activities.

Mitigation Measure 3.3.7d (Avoidance of Maternity Roosts). If a maternity colony is detected during preconstruction surveys, the biologist will identify a suitable disturbance-free buffer around the colony. The buffer will remain in place until the biologist determines that the nursery is no longer active.

Implementation of the above measures will reduce potential impacts associated with construction-related mortality of roosting pallid bats, western mastiff bats, Townsend's big-eared bats, and other native bat species to a less than significant level under CEQA.

3.3.8 Potential Impacts to Native Wildlife Nursery Sites

Potential Impacts. A number of features within the planning area provide nursery sites for wildlife species. For example, bridges over the planning area's canals and creeks provide nesting habitat for cliff swallows. Wheat fields and riparian habitat associated with the Kings River and Collins Creek may be used by colonies of nesting red-winged blackbirds or tricolored blackbirds. Cavities in large trees and abandoned or dilapidated structures provide potential maternity roost habitat for bats. Future projects that remove bridges, buildings, trees, or riparian vegetation have the potential to destroy wildlife nursery sites and potentially result in the mortality of many individual bats and birds. Such impacts would be considered significant under CEQA.

Mitigation. Impacts to colonially nesting birds were considered in Section 3.3.6 and fully mitigated with *Mitigation Measures 3.3.6a-c*. Impacts to maternity bat roosts were considered in

Section 3.3.7 and fully mitigated with *Mitigation Measures 3.3.7a-d*. No further mitigation is required.

3.3.9 Potential Impacts to Riparian and Other Sensitive Habitats

Potential Impacts. As discussed, Kings River and Collins Creek within the planning area support riparian habitat of considerable value to native wildlife species. Any future project-related loss of riparian habitat along these natural drainages would be likely to adversely affect native wildlife, both in terms of direct impacts and contribution to cumulative loss of riparian habitat in the region. Potential loss of riparian habitat along the Kings River and Collins Creek is considered a significant impact under CEQA.

Elsewhere within the planning area, the Fowler-Switch Canal and Centerville-Kingsburg Canal contain isolated riparian trees along their banks, but are not characterized by intact riparian habitat with the potential to support a diversity of native wildlife. Impacts to riparian habitat associated with the potential loss of trees along the Fowler-Switch Canal and Centerville-Kingsburg Canal are therefore considered less than significant under CEQA.

Mitigation. The following measures are required for future projects that will remove riparian vegetation along the Kings River and Collins Creek.

> ***Mitigation Measure 3.3.9a (Tree Surveys).*** Both prior to and immediately following project activities in riparian habitat along the Kings River and Collins Creek, a qualified biologist will conduct a tree survey within project boundaries. The location of each tree in the survey area will be mapped, and species and diameter at breast height (DBH) recorded.
>
> ***Mitigation Measure 3.3.9b (Riparian Mitigation and Monitoring Plan).*** If the follow-up tree survey determines that native riparian trees greater than 4 inches DBH have been removed by project activities, a qualified biologist will prepare a riparian mitigation and monitoring plan that will provide a framework for required compensatory mitigation. The plan will outline the required planting scenario, success criteria, and monitoring requirements.
>
> ***Mitigation Measure 3.3.9c (Compensatory Mitigation).*** Compensatory mitigation will be provided for the removal of any native riparian tree 4 inches DBH or greater. Trees between 4 and 24 inches DBH will be replaced on or immediately adjacent to the project site at a ratio of 3:1. Trees greater than 24 inches DBH will be replaced on or immediately adjacent to the project site at a ratio of 10:1. The planting and subsequent

monitoring effort will be conducted in accordance with the riparian mitigation and monitoring plan provided for in *Mitigation Measure 3.3.9b.*

Implementation of the above measures will reduce potential impacts to riparian habitat to a less than significant level under CEQA.

3.3.10 Potential Impacts to Wildlife Movement Corridors

Potential Impacts. The planning area contains a portion of the Kings River, which is known to function as an important movement corridor for wildlife in the region. The remaining drainages and canals of the planning area are not expected to function in this capacity. As discussed in Section 2.7, portions of Collins Creek within the planning area have been realigned and cleared of riparian vegetation, resulting in a discontinuous riparian corridor not conducive to travel by most wildlife species. The planning area's canals and ditches are largely devoid of riparian vegetation, and do not offer the cover typical of most terrestrial wildlife movement corridors.

If future projects in the planning area remove riparian habitat associated with the Kings River, the river's value as a wildlife movement corridor may decrease. Such an impact would be considered significant under CEQA.

Mitigation. Potential impacts to the Kings River riparian corridor were considered in Section 3.3.9 and fully mitigated with *Mitigation Measures 3.3.9a-c*. No further mitigation is required.

3.3.11 Potential Impacts to Waters of the U.S.

Potential Impacts. As discussed, the planning area contains a portion of the Kings River and Collins Creek, both of which are known to fall under the jurisdiction of the USACE. The planning area also contains portions of a number of canals and ditches that may be claimed by the USACE based on hydrological connectivity to the Kings River and other Waters of the U.S. Any future projects within these waterways have the potential to result in significant impacts to the Waters of the U.S. per the provisions of CEQA.

Mitigation. The following measures are required for future projects that will discharge fill into or otherwise impact the Kings River, Collins Creek, and/or canals or ditches of the planning area (see "Drainages/Canals" on Figure 3).

Mitigation Measure 3.3.11a (Delineation of Jurisdictional Waters). Prior to the start of construction, a qualified biologist will conduct a delineation of jurisdictional waters within and adjacent to the waterway(s) proposed for impact. The survey techniques, delineation report, and accompanying waters map will meet the minimum standards of the USACE. The report and map will be submitted to the USACE for purposes of obtaining a Preliminary Jurisdictional Determination or Approved Jurisdictional Determination, at the project applicant's discretion.

Mitigation Measure 3.3.11b (Clean Water Act Permitting). If it is determined that the waterway(s) to be impacted fall under the jurisdiction of the USACE, the project applicant will obtain a Clean Water Act Section 404 permit and Section 401 Water Quality Certification, and will adhere to all the provisions thereof, including compensatory mitigation requirements for loss of Waters of the U.S.

Implementation of the above measures will reduce potential impacts to Waters of the U.S. to a less than significant level under CEQA, and ensure compliance with state and federal laws protecting this resource.

3.3.12 Degradation of Water Quality in Downstream Waters

Potential Impacts. Extensive ground disturbance associated with construction projects often leaves the soils of construction zones barren of vegetation and, therefore, vulnerable to erosion. Eroded soil is generally carried as sediment in surface runoff to be deposited in natural creek beds, canals, and adjacent wetlands. Runoff is often polluted with grease, oil, pesticide and herbicide residues, and/or heavy metals.

The planning area contains a number of canals, ditches, and natural drainages, any of which may be vulnerable to sedimentation or pollution as a result of future project-related ground disturbance in their vicinity. Degradation of water quality in canals, ditches, and natural drainages as a result of future project activities is considered a potentially significant impact under CEQA.

It should be noted that projects involving the grading of large tracts of land must be in compliance with provisions of a General Construction permit (a type of NPDES permit) available from the RWQCB.

Mitigation. The following measures are required for future projects constructed within 100 feet of any of the planning area's canals, ditches, or natural drainages (see "Drainages/Canals" on Figure 3).

> ***Mitigation Measure 3.3.12a (Erosion Control Measures).*** The project applicant shall define the limits of construction. Wattles or other appropriate erosion controls will be placed between the construction site and the surface water feature, unless there is already a significant barrier such as a canal or ditch berm/bank that would prevent any runoff form passing into it.
>
> ***Mitigation Measure 3.3.12b. (Storm Water Pollution Prevention Plan).*** For projects that are 1 acre or more in size, the project applicant will arrange for the preparation of a Storm Water Pollution Prevention Plan (SWPPP) that identifies measures to prevent erosion and sedimentation of the planning area's waterways and measures to prevent contaminants from entering storm water. The SWPPP will be implemented in full during project construction.

Implementation of the above measures will reduce potential impacts to water quality to a less than significant level under CEQA.

3.4 LESS THAN SIGNIFICANT IMPACTS

3.4.1 Potential Impacts to Special Status Plants Absent or Unlikely within the Planning Area

Potential Impacts. Of the twelve special status plant species potentially occurring in the region, eleven are considered absent from or unlikely to occur within the planning area due to the absence of suitable habitat and/or the planning area's being situated outside of the species' known distribution. These species are the succulent owl's-clover (*Castilleja campestris succulenta*), California jewel-flower (*Caulanthus californicus*), San Joaquin Valley orcutt grass (*Orcuttia inaequalis*), San Joaquin adobe sunburst (*Pseudobahia peirsonii*), Keck's checkerbloom (*Sidalcea keckii*), Greene's tuctoria (*Tuctoria greenei*), spiny-sepaled button-celery (*Eryngium spinosepalum*), forked hare-leaf (*Lagophylla dichotoma*), Madera leptosiphon (*Leptosiphon serrulatus*), California satintail (*Imperata brevifolia*), and caper-fruited tropidocarpum (*Tropidocarpum capparideum*). Future projects would have no effect on individuals or regional populations of these special status plant species.

Mitigation. None warranted.

3.4.2 Potential Impacts to Special Status Animals Absent or Unlikely within the Planning Area

Potential Impacts. Seven of the nineteen regionally occurring special status animal species are considered absent from or unlikely to occur within the planning area due to past and ongoing disturbance of the planning area's habitats, the absence of suitable habitat, and/or the planning area's being situated outside of the species' known distribution. These species are the vernal pool fairy shrimp (*Branchinecta lynchi*), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), California tiger salamander (*Ambystoma californiense*), western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), least Bell's vireo (*Vireo bellii pusillus*), San Joaquin kit fox, and western spadefoot (*Spea hammondii*). Future projects in the planning area do not have the potential to significantly impact these seven special status species through construction mortality or loss of habitat because there is little or no likelihood that they are present.

Mitigation. None warranted.

3.4.3 Potential Impacts to Designated Critical Habitat

Potential Impacts. Future projects will have no effect on designated critical habitat because critical habitat is absent from the planning area and surrounding lands.

Mitigation. Mitigation is not warranted.

3.4.4 Compliance with Local Policies and Habitat Conservation Plans

Potential Impacts. It is assumed that all future development within the planning area will be consistent with the provisions of the City of Sanger General Plan. No known Habitat Conservation Plans are in effect for the planning area.

Mitigation. None warranted.

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APPENDIX A: SELECTED PHOTOGRAPHS

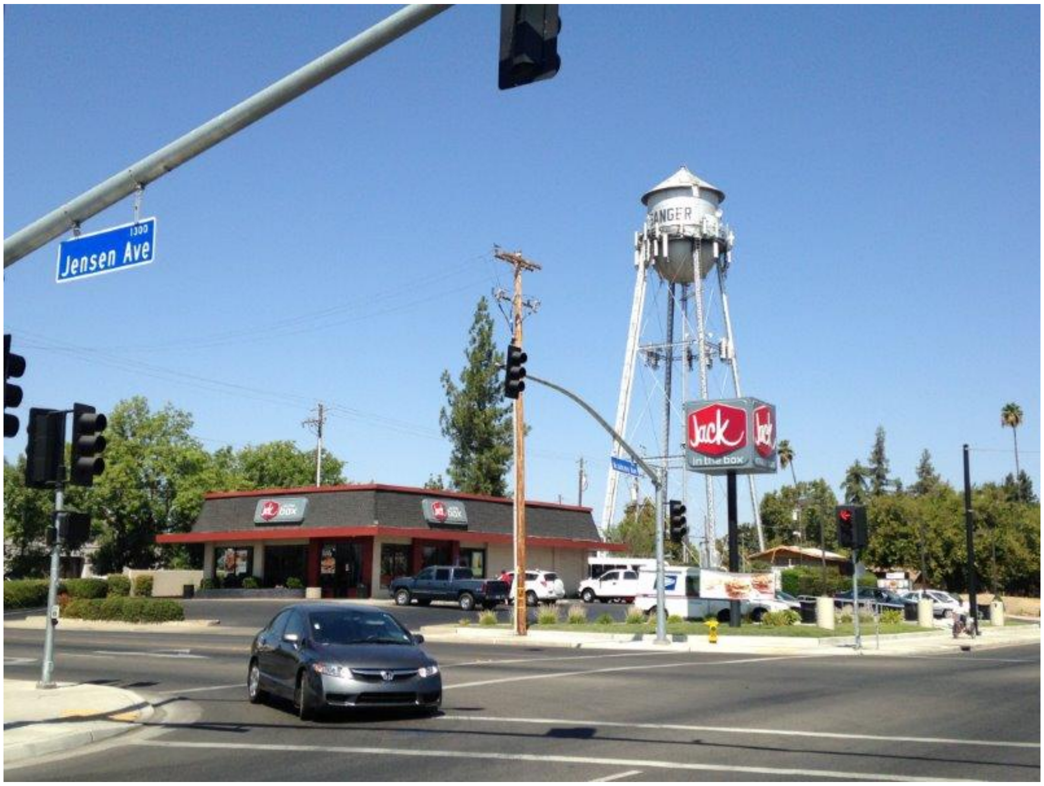

Photo 1 (above). Urban land use of the planning area; pictured is a commercial area at the corner of Academy and Jensen Avenues. **Photo 2 (below).** Urban land use of the planning area; pictured is a residential street.

Photo 3 (above). Agricultural habitat of the planning area; pictured is a corn field along Central Avenue. **Photo 4 (below).** Agricultural habitat of the planning area; pictured is an alfalfa field associated with the Sanger Wastewater Treatment Facility.

Photo 5 (above). Rural developed habitat along Quality Avenue. **Photo 6 (below).** Ruderal habitat of the planning area; pictured is a disced field.

Photo 7 (above). Non-native grassland habitat along Quality Avenue. **Photo 8 (below).** The Fowler-Switch Canal, one of several irrigation canals in the planning area.

Photo 9 and 10. The Kings River (above) and Collins Creek (below) are the only two natural drainages that pass through the planning area.

Photo 11 (above). Portions of Collins Creek within the planning area have been realigned, with little riparian vegetation remaining. **Photo 12 (below).** One of several artificial ponds in the planning area's urban zone; pictured is a stormwater detention basin.

Photo 13 (above). One of several artificial ponds in the planning area's rural zone; pictured is a retired wastewater pond adjacent to the active Sanger Wastewater Treatment Facility.

Appendix B

CHRIS & Sacred Lands File

CALIFORNIA HISTORICAL RESOURCES INFORMATION SYSTEM

FRESNO
KERN
KINGS
MADERA
TULARE

Southern San Joaquin Valley Information Center
California State University, Bakersfield
Mail Stop: 46 MEC
9001 Stockdale Highway
Bakersfield, California 93311-1022
(661) 654-2289 FAX (661) 654-2415
E-mail: ssjvic@csub.edu

Record Search 16-141

To: Emily Bowen
Crawford Bowen Planning, Inc.
113 N. Church Street, Suite 302
Visalia, CA 93291

Date: April 28, 2016

Re: City of Sanger General Plan Update

County: Fresno

Map(s): Sanger 7.5'

CULTURAL RESOURCES RECORDS SEARCH

The California Office of Historic Preservation (OHP) contracts with the California Historical Resources Information System's (CHRIS) regional Information Centers (ICs) to maintain information in the CHRIS inventory and make it available to local, state, and federal agencies, cultural resource professionals, Native American tribes, researchers, and the public. Recommendations made by IC coordinators or their staff regarding the interpretation and application of this information are advisory only. Such recommendations do not necessarily represent the evaluation or opinion of the State Historic Preservation Officer in carrying out the OHP's regulatory authority under federal and state law.

The following are the results of a search of the cultural resource files at the Southern San Joaquin Valley Information Center. These files include known and recorded cultural resources sites, inventory and excavation reports filed with this office, and resources listed on the National Register of Historic Places, Historic Property Directory (3/18/13), California State Historical Landmarks, California Register of Historical Resources, California Inventory of Historic Resources, and California Points of Historical Interest. Due to processing delays and other factors, not all of the historical resource reports and resource records that have been submitted to the Office of Historic Preservation are available via this records search. Additional information may be available through the federal, state, and local agencies that produced or paid for historical resource management work in the search area.

PRIOR CULTURAL RESOURCE STUDIES CONDUCTED WITHIN THE PROJECT AREA

According to the information in our files, there have been 28 previous cultural resource studies conducted within the project area. A list is enclosed.

KNOWN/RECORDED CULTURAL RESOURCES WITHIN THE PROJECT AREA

There are 18 recorded cultural resources within the project area. Additionally, there is one known but unrecorded resource with the project area. A list is enclosed. These resources consist primarily of historic era canals and single family residences. They also include a prehistoric lithic scatter, an historic era railroad, and an historic era farm.

There are no recorded cultural resources within the project area or radius that are listed in the National Register of Historic Places, the California Register of Historical Resources, the California Points of Historical Interest, California Inventory of Historic Resources, or the California State Historic Landmarks.

COMMENTS AND RECOMMENDATIONS

We understand this project consists of a general plan update to the City of Sanger. As no ground disturbance will result from this project, no further cultural resources investigation is recommended at this time. The City of Sanger and its surrounding areas are considered to have low to moderate sensitivity for archaeological resources. Due to the size of the project area, it is impossible for our office to make a general recommendation for further cultural resource investigation where ground disturbance may take place. Therefore, prior to any ground disturbance activities, we recommend a new Record Search be conducted on those specific properties so that specific recommendations for further cultural resource investigation can be made.

We also recommend that you contact the Native American Heritage Commission in Sacramento. They will provide you with a current list of Native American individuals/organizations that can assist you with information regarding cultural resources that may not be included in the CHRIS Inventory and that may be of concern to the Native groups in the area. The Commission will consult their "Sacred Lands Inventory" file in order to determine what sacred resources, if any, exist within this project area and the way in which these resources might be managed. Finally, please consult with the lead agency on this project to determine if any other cultural resource investigation is required. If you need any additional information or have any questions or concerns, please contact our office at (661) 654-2289.

By:

Celeste M. Thomson, Coordinator

Date: April 28, 2016

Please note that invoices for Information Center services will be sent under separate cover from the California State University, Bakersfield Accounting Office.

SSJVIC Record Search 16-141

Reports in PA: FR-

2
3
4
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10
135
295
435
533
535
620
667
784
1121
1224
1758
1815
2166
2178
2179
2189
2361
2424
2437
2453
2471
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Resources in PA: P-10-

692
2963
3930
4724
5110
5111
5112
5812
5974
6046
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6053
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6055
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6061
PRO-5

NATIVE AMERICAN HERITAGE COMMISSION
1550 Harbor Blvd., Suite 100
West Sacramento, CA 95691
(916) 373-3710
(916) 373-5471 - Fax

April 25, 2016

Emily Bowen
Crawford & Bowen Planning, Inc.

Sent via e-mail: Emily@candbplanning,com
Number of pages: 2

RE: Proposed City of Sanger General Plan Update Project, City of Sanger, Sanger USGS Quadrangle, Fresno County, California

Dear Ms. Bowen:

Government Code §65352.3 **requires local governments** to consult with California Native American tribes identified by the Native American Heritage Commission (NAHC) for the purpose of protecting, and/or mitigating impacts to cultural places in creating or amending general plans, including specific plans. Attached is a consultation list of tribes traditionally and culturally affiliated with the area that may have cultural places located within the boundaries of the project referenced above.

As a part of consultation, the NAHC recommends that local governments conduct record searches through the NAHC and California Historic Resources Information System (CHRIS) to determine if any cultural places are located within the area(s) affected by the proposed action. A record search of the Native American Heritage Commission (NAHC) *Sacred Lands File* was completed for the area of potential project effect (APE) referenced above with negative results. Please note that the absence of specific site information in the *Sacred Lands File* does not indicate the absence of Native American cultural resources in any APE. Records maintained by the NAHC and CHRIS are not exhaustive, and a negative response to these searches does not preclude the existence of a cultural place. A tribe may be the only source of information regarding the existence of tribal cultural resources.

The list should provide a starting place to locate areas of potential adverse impact within the APE. I suggest you contact all of those listed, if they cannot supply information, they might recommend others with specific knowledge. By contacting all those on the list, your organization will be better able to respond to claims of failure to consult. If a response has not been received within two weeks of notification, the NAHC requests that you follow-up with a telephone call to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from tribes on the attached list, please notify me. With your assistance we are able to assure that our consultation list contains current information.

If you have any questions, please contact me at my email address: gayle.totton@nahc.ca.gov.

Sincerely,

Gayle Totton, M.A., PhD.
Associate Governmental Program Analyst

Native American Tribal Consultation List
Fresno County
April 25, 2016

Picayune Rancheria of Chukchansi
Reggie Lewis Chairperson
8080 Palm Ave, Suite 207 — Chukchansi / Yokut
Fresno, CA 93711

Table Mountain Rancheria
Bob Pennell, Cultural Resources Director
P.O. Box 410 — Yokuts
Friant, CA 93626
rpennell@tmr.org
(559) 325-0351
(559) 217-9718 - cell

Santa Rosa Rancheria Tachi Yokut Tribe
Rueben Barrios Sr., Chairperson
P.O. Box 8 — Tache
Lemoore, CA 93245 — Tachi
Yokut
(559) 924-1278

Kings River Choinumni Farm Tribe
Stan Alec
3515 East Fedora Avenue — Foothill Yokuts
Fresno, CA 93726 — Choinumni
(559) 647-3227 Cell

Table Mountain Rancheria
Leanne Walker-Grant, Chairperson
P.O. Box 410 — Yokuts
Friant, CA 93626
(559) 822-2587

Traditional Choinumni Tribe
David Alvarez, Chairperson
2415 E. Houston Avenue
Fresno, CA 93720
davealvarez@sbcglobal.net — Choinumni
(559) 323-6231
(559) 217-0396 Cell

Tule River Indian Tribe
Neil Peyron, Chairperson
P.O. Box 589 — Yokuts
Porterville, CA 93258
chairman@tulerivertribe-nsn.gov
(559) 781-4271

Dumna Wo-Wah Tribal Goverment
Robert Ledger SR., Tribal Chairperson
2216 East Hammond Street — Dumna/Foothill
Fresno, CA 93703 — Mono
ledgerrobert@ymail.com
(559) 519-1742 Office

This list is current only as of the date of this document and is based on the information available to the Commission on the date it was produced. Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code. This list is applicable only for consultation with Native American tribes under Government Code Sections 65352.3 and 65362.4 et seq. for the proposed SCity of Sanger General Plan Update Project, City of Sanger, Sanger USGS Quadrangle, Fresno County, California.

Appendix C

Environmental Noise Assessment

ENVIRONMENTAL NOISE ASSESSMENT

NORTH ACADEMY CORRIDOR MASTER PLAN
SANGER, CALIFORNIA

WJVA Report No. 16-009-B

PREPARED FOR

COLLINS & SCHOETTLER PLANNING CONSULTANTS
1002 WEST MAIN STREET
VISALIA, CA 93291

PREPARED BY

WJV ACOUSTICS, INC.
VISALIA, CALIFORNIA

APRIL 5, 2019

1. INTRODUCTION

Project Description:

The City of Sanger proposes the annexation of approximately 230 acres, along the west side of South Academy Avenue as well as the east side of South Bethel Avenue, between the City's current northern City Limits boundary, California Avenue, to the South and East Kings Canyon Road (State Route 180) to the North, in Fresno County. The project site is currently predominantly agricultural land uses. The annexation would include changes in land use designations to include the following:

- Mixed Use Retail: 152.7 acres
- Neighborhood Commercial: 7.9 acres
- Medium Density Residential: 48 acres
- Medium High Density Residential: 16.5 acres
- High Density Residential: 4.1 acres

The North Academy Corridor Master Plan (hereafter referred to as "project") site plan is provided as Figure 1. The site plan provides the project area as well as the proposed changes to land use designations.

Environmental Noise Assessment:

This environmental noise assessment has been prepared by WJV Acoustics, Inc. (WJVA) to determine if significant noise impacts would be expected to occur as a result of implementation of the Master Plan, and to describe mitigation measures for noise if significant impacts are determined.

Appendix A provides definitions of the acoustical terminology used in this report. Unless otherwise stated, all sound levels reported in this analysis are A-weighted sound pressure levels in decibels (dB). A-weighting de-emphasizes the very low and very high frequencies of sound in a manner similar to the human ear. Most community noise standards utilize A-weighted sound levels, as they correlate well with public reaction to noise. Appendix B provides examples of sound levels for reference.

2. THRESHOLDS OF SIGNIFICANCE

The California Environmental Quality Act (CEQA) requires that significant environmental impacts be identified for proposed development projects, and that such impacts be eliminated or mitigated to the extent feasible. A significant effect from noise may exist if a project would:

- Result in 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,

- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project,

- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project, or

- Result in exposure of persons to or generation of excessive ground borne vibration or ground borne noise levels.

a. Noise Level Standards

CITY OF SANGER

The City of Sanger is currently undergoing a General Plan Update (GPU). The General Plan Update is scheduled for adoption during the summer of 2019. The land use compatibility guidelines and subsequent noise level standards described below represent those which are anticipated to be adopted with the GPU.

Table I and Table II provide exterior noise levels that are considered to be "normally" acceptable for the described land use categories. The exterior noise level standards are to be applied to outdoor activity areas. Outdoor activity areas generally include backyards of single-family residences, individual patios or decks of multi-family developments and common outdoor recreation areas of multi-family developments. The intent of the exterior noise level requirement is to provide an acceptable noise environment for outdoor activities and recreation.

Additionally, Table I provides acceptable interior noise levels for noises attributable to exterior noise sources. The interior noise level standards are consistent with those provided by the California State Building Code (Title 24 of the California Code of Regulations) and are intended to provide an acceptable noise environment for indoor communication and sleep.

TABLE I CITY OF SANGER MAXIMUM ALLOWABLE NOISE EXPOSURE TRANSPORTATION NOISE SOURCES dBA, L_{dn}		
Land Use Category	Exterior, Outdoor Activity Areas[1]	Interior
Residential-Low Density Single Family,	65	45
Multi-Family, Duplex, Mobil Homes	65	45
Transient Lodging-Motels, Hotels	65	45
Churches and Meeting Halls	65	45
Office Buildings, Schools, Libraries and Theaters	--	45

[1]Where the location of the outdoor activity areas is unknown or is not applicable, the exterior noise level standard shall be applied to the boundary of the planned or zoned noise-sensitive use.

Source: City of Sanger GPU

TABLE II CITY OF SANGER MAXIMUM ALLOWABLE NOISE EXPOSURE STATIONARY (NON-TRANSPORTATION) NOISE SOURCES dBA, L_{dn}		
Outdoor Activity Areas[1]	Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)
Hourly L_{eq}, dBA	55	50
Maximum (L_{max}), dBA	75	65

[1]Where the location of the outdoor activity areas is unknown or is not applicable, the exterior noise level standard shall be applied to the boundary of the planned or zoned noise-sensitive use.

Source: City of Sanger GPU

State of California

There are no state noise standards that are applicable to the project.

Federal Noise Standards

There are no federal noise standards that are applicable to the project.

Substantial Noise Increases

CEQA does not define what constitutes a substantial increase in noise levels. Some guidance is provided by the 1992 findings of the Federal Interagency Committee on Noise (FICON)[2], which assessed changes in ambient noise levels resulting from aircraft operations. The FICON recommendations are based upon studies that relate aircraft and traffic noise levels to the percentage of persons highly annoyed by the noise. The rationale for the FICON recommendations is that it is possible to consistently describe the annoyance of people exposed to transportation noise in terms of the DNL (or CNEL). Annoyance is a summary measure of the general adverse reaction of people to noise that results in speech interference, sleep disturbance, or interference with other daily activities.

Although the FICON recommendations were specifically developed to address aircraft noise impacts, they are used in this analysis for all transportation noise sources that are described in terms of cumulative noise exposure metrics such as the DNL or CNEL. Table III summarizes the FICON recommendations.

TABLE III

MEASURES OF SUBSTANTIAL NOISE INCREASE FOR TRANSPORTATION SOURCES

Ambient Noise Level Without Project (DNL/CNEL)	Significant Impact Assumed to Occur if the Project Increases Ambient Noise Levels By:
<60 dB	+ 5 dB or more
60-65 dB	+3 dB or more
>65 dB	+1.5 dB or more

Source: FICON, 1992, as applied by WJV Acoustics, Inc.

For noise sources that are not transportation related, which usually includes commercial or industrial activities and other stationary noise sources, it is common to assume that a 3-5 dB increase in noise levels represents a substantial increase in ambient noise levels. This is based on laboratory tests that indicate that a 3 dB increase is the minimum change perceptible to most people, and a 5 dB increase is perceived as a “definitely noticeable change.”

b. Construction Noise

The City of Sanger General Plan Update provides the following guidance in regards to construction noise.

- Limit hours of construction to between the hours of 6:00 a.m. and 10:00 p.m., Monday through Saturday.

- Prohibit construction activities on Sundays and Holidays.

- Reduce noise associated with construction activities by requiring all construction equipment to be properly maintained and muffled.

- Require the placement of stationary noise-producing equipment be located as far as possible from existing noise-sensitive land uses.

c. Vibration

There are no state or federal standards that specifically address construction vibration. Additionally, the City of Sanger GPU and Municipal Code do not specifically provide vibration guidelines or standards. Some guidance is provided by the Caltrans Transportation and Construction Vibration Guidance Manual. The Manual provides guidance for determining annoyance potential criteria and damage potential threshold criteria. These criteria are provided below in Table IV and Table V and are presented in terms of peak particle velocity (PPV) in inches per second (in/sec).

TABLE IV

GUIDELINE VIBRATION ANNOYANCE POTENTIAL CRITERIA

Human Response	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Barely Perceptible	0.04	0.01
Distinctly Perceptible	0.25	0.04
Strongly Perceptible	0.9	0.1
Severe	2.0	0.4

Source: Caltrans

TABLE V

GUIDELINE VIBRATION DAMAGE POTENTIAL THRESHOLD CRITERIA

Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile, historic buildings, 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

Source: Caltrans

3. EXISTING NOISE ENVIRONMENT

The predominant existing noise sources affecting the project site and surrounding area include vehicular traffic on local roadways, aircraft overflights and noise associated with existing agricultural activities. Additionally, the San Joaquin Valley Railroad (SJVR) line is located at the southern boundary of the project site. According to the Federal Rail Authority, two train operations occur per day along the line.

a. Background Noise Level Measurements

Measurements of existing ambient noise levels in the project vicinity were conducted on April 2, 2019. Long-term (24-hour) ambient noise level measurements were conducted at two (2) locations (sites LT1 and LT2). Site LT1 was located near the northeast portion of the project site, and was exposed to noise associated with vehicle traffic along Academy Avenue and Kings Canyon Road, as well as nearby commercial/industrial and agricultural activities. Site LT 2 was located along South Fairbanks Avenue, near the southern portion of the project site, and was exposed to noise associated with vehicle traffic along Fairbanks Avenue, as well as noise associated with agricultural activities and railroad operations along the SJVR. Figure 2 provides the locations of the two ambient noise monitoring sites.

Noise monitoring equipment consisted of Larson-Davis Laboratories Model LDL-820 sound level analyzers equipped with B&K Type 4176 1/2" microphones. The equipment complies with the specifications of the American National Standards Institute (ANSI) for Type I (Precision) sound level meters. The meters were calibrated with a B&K Type 4230 acoustic calibrator to ensure the accuracy of the measurements.

Table VI provides the hourly average noise levels (L_{eq}), the hourly maximum (L_{max}) and the L_{90} statistical noise levels at the 24-hour measurement site, LT1. Measured hourly energy average noise levels (L_{eq}) at site LT1 ranged from a low of 47.1 dB between 2:00 a.m. and 3:00 a.m. to a high of 67.2 dBA between 3:00 p.m. and 4:00 p.m. Hourly maximum (L_{max}) noise levels at site LT1 ranged from 61.0 to 92.8 dBA. Residual noise levels at the monitoring site, as defined by the L_{90}, ranged from 30.3 to 56.3 dBA. The L_{90} is a statistical descriptor that defines the noise level exceeded 90% of the time during each hour of the sample period. The L_{90} is generally considered to represent the residual (or background) noise level in the absence of identifiable single noise events from traffic, aircraft and other local noise sources. The measured L_{dn} value at site LT1 during the day of noise monitoring was 60.9 dB L_{dn}. Figure 3 graphically depicts hourly variations in ambient noise levels at site LT1. Figure 4 provides a photograph of the LT1 noise monitoring site.

TABLE VI SUMMARY OF 24-HOUR NOISE LEVEL MEASUREMENTS, LT1 NORTH ACADEMY CORRIDOR MASTER PLAN APRIL 2, 2019			
Time	A-Weighted Decibels, dB, L_{eq} (one-hour average)		
	LT1		
	L_{eq}	L_{max}	L_{90}
12:00 a.m.	47.8	61.0	34.3
1:00 a.m.	47.2	61.1	31.0
2:00 a.m.	47.1	67.3	30.3
3:00 a.m.	47.9	62.2	34.4
4:00 a.m.	51.2	73.4	36.6
5:00 a.m.	55.0	69.3	45.8
6:00 a.m.	59.0	70.8	52.3
7:00 a.m.	62.3	86.7	56.3
8:00 a.m.	58.0	78.5	49.7
9:00 a.m.	55.9	68.4	49.0
10:00 a.m.	56.3	79.4	46.6
11:00 a.m.	55.8	74.4	48.3
12:00 p.m.	56.4	72.5	47.2
1:00 p.m.	59.2	79.6	46.5
2:00 p.m.	62.8	89.9	46.1
3:00 p.m.	67.2	92.8	46.9
4:00 p.m.	56.3	75.7	48.7
5:00 p.m.	55.0	72.3	48.3
6:00 p.m.	53.4	66.8	45.4
7:00 p.m.	53.1	70.4	43.2
8:00 p.m.	51.4	77.4	42.4
9:00 p.m.	51.4	75.0	39.5
10:00 p.m.	50.3	69.9	38.0
11:00 p.m.	48.5	62.1	35.4
24-Hour L_{dn}, dB	60.9 db L_{dn}		

Source: WJV Acoustics, Inc.

Table VII provides the hourly average noise levels (L_{eq}), the hourly maximum (L_{max}) and the L_{90} statistical noise levels at the 24-hour measurement site, LT2. Measured hourly energy average noise levels (L_{eq}) at site LT2 ranged from a low of 50.4 dB between 2:00 a.m. and 3:00 a.m. to a high of 70.0 dBA between 9:00 a.m. and 10:00 a.m. Hourly maximum (L_{max}) noise levels at site LT2 ranged from 75.9 to 96.7 dBA. Residual noise levels at the monitoring site, as defined by the L_{90}, ranged from 29.1 to 46.8 dBA. The L_{90} is a statistical descriptor that defines the noise level exceeded 90% of the time during each hour of the sample period. The L_{90} is generally considered to represent the residual (or background) noise level in the absence of identifiable single noise events from traffic, aircraft and other local noise sources. The measured L_{dn} value at site LT2 during the day of noise monitoring was 65.5 dB L_{dn}. Figure 5 graphically depicts hourly variations in ambient noise levels at site LT2. Figure 6 provides a photograph of the LT2 noise monitoring site.

TABLE VII

SUMMARY OF 24-HOUR NOISE LEVEL MEASUREMENTS, LT2
NORTH ACADEMY CORRIDOR MASTER PLAN
APRIL 2, 2019

Time	A-Weighted Decibels, dB, L_{eq} (one-hour average)		
	LT1		
	L_{eq}	L_{max}	L_{90}
12:00 a.m.	54.2	76.9	33.1
1:00 a.m.	54.5	81.4	30.4
2:00 a.m.	50.4	76.2	29.1
3:00 a.m.	50.7	77.1	35.6
4:00 a.m.	52.6	75.9	33.1
5:00 a.m.	57.0	77.2	39.3
6:00 a.m.	61.1	80.0	45.8
7:00 a.m.	64.3	80.3	46.8
8:00 a.m.	63.0	82.0	40.0
9:00 a.m.	70.0	96.7	35.4
10:00 a.m.	61.7	79.2	37.3
11:00 a.m.	69.5	95.3	41.3
12:00 p.m.	67.2	82.1	40.0
1:00 p.m.	64.1	77.9	39.9
2:00 p.m.	64.7	88.4	41.2
3:00 p.m.	62.6	79.1	39.7
4:00 p.m.	66.2	93.3	43.7
5:00 p.m.	65.6	85.9	45.8
6:00 p.m.	61.5	79.8	42.5
7:00 p.m.	60.9	79.3	46.2
8:00 p.m.	60.4	79.0	40.3
9:00 p.m.	60.7	78.6	37.1
10:00 p.m.	55.4	78.6	34.5
11:00 p.m.	56.0	77.6	34.4
24-Hour L_{dn} dB	65.5 db L_{dn}		

Source: WJV Acoustics, Inc.

b. Existing Traffic Noise Exposure

Noise levels from traffic on roadways in the project vicinity were calculated for existing conditions using the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model and traffic data obtained from the traffic study prepared by GHD. The day/night distribution of traffic and the percentages of trucks on the roadways used for modeling were obtained from similar studies WJA has conducted in the area. The percentages of trucks on SR 180 was obtained from Caltrans. The traffic noise modeling data summarized by Appendix C represent the best information known to WJVA at the time this analysis was prepared.

The FHWA Model is a standard analytical method used for roadway traffic noise calculations. The model is based upon reference energy emission levels for automobiles, medium trucks (2 axles) and heavy trucks (3 or more axles), with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site. The FHWA Model was developed to predict hourly L_{eq} values for free-flowing traffic conditions, and is generally considered to be accurate within ±1.5 dB. To predict L_{dn} values, it is necessary to determine the hourly distribution of traffic for a typical day and adjust the traffic volume input data to yield an equivalent hourly traffic volume. The FHWA Model assumes a clear view of traffic with no shielding at the receiver location.

Table VIII summarizes calculated traffic noise exposure for existing traffic conditions along roadways in the project area. Shown are the calculated L_{dn} values at a reference setback distance of 100 feet from the roadway.

TABLE VIII

EXISTING TRAFFIC NOISE EXPOSURE LEVELS
NORTH ACADEMY CORRIDOR MASTER PLAN

Roadway Name	L_{dn}, dB[1]
Academy Avenue (North of SR 180)	62.2
Academy Avenue (South of SR 180)	63.1
Academy Avenue (North of Butler Avenue)	63.2
Academy Avenue (South of Butler Avenue)	63.2
Academy Avenue (North of California Avenue)	63.2
Academy Avenue (South of California Avenue)	63.2
Academy Avenue (North of Geary Avenue)	63.2
Academy Avenue (South of Geary Avenue)	63.2
Academy Avenue (North of Florence Avenue)	63.3
Academy Avenue (South of Florence Avenue)	63.4
Academy Avenue (North of Church Avenue)	63.4
Academy Avenue (South of Church Avenue)	63.0
SR 180 (West of Academy Avenue)	68.2
SR 180 (East of Academy Avenue)	67.9
SR 180 (West of Bethel Avenue)	69.2
SR 180 (East of Bethel Avenue)	68.1
Butler Avenue (West of Academy Avenue)	---
Butler Avenue (East of Academy Avenue)	45.0
California Avenue (West of Academy Avenue)	---
California Avenue (East of Academy Avenue)	49.2
Geary Avenue (East of Academy Avenue)	39.6
Florence Avenue (East of Academy Avenue)	48.3
Church Avenue (East of Academy Avenue)	54.5
Church Avenue (West of Bethel Avenue)	52.4
Church Avenue (East of Bethel Avenue)	55.1
Bethel Avenue (North of SR 180)	53.8
Bethel Avenue (South of SR 180)	60.5
Bethel Avenue (North of Church Avenue)	60.0
Bethel Avenue (South of Church Avenue	61.0

[1]At a reference setback distance of 100 feet from roadway

Source: WJV Acoustics, Inc.

4. PROJECT IMPACT ASSESSMENT

a. Project Traffic Noise Impacts on Existing Noise-Sensitive Land Uses Outside Project Site (No Impact)

Traffic noise exposure for Existing and Cumulative 2035 traffic conditions were calculated for both “no project” and “plus project” scenarios, based upon the FHWA Model and the above-described traffic study. Table IX summarizes calculated traffic noise exposure for Existing conditions, with and without the project. Table X summarizes calculated traffic noise exposure for cumulative future 2035 conditions, with and without the project. Shown are the calculated L_{dn} values at a reference setback distance of 100 feet from each analyzed roadway.

TABLE IX

COMPARISON OF "NO PROJECT" AND "PLUS PROJECT" SCENARIOS
TRAFFIC NOISE EXPOSURE-EXISTING CONDITIONS
NORTH ACADEMY CORRIDOR MASTER PLAN

Roadway Name	L_{dn}, dB[1]		Change	Significant Impact?
	No Project	Plus Project		
Academy Avenue (North of SR 180)	62.2	62.9	+0.7	No
Academy Avenue (South of SR 180)	63.1	65.3	+2.2	No[2]
Academy Avenue (North of Butler Avenue)	63.2	64.6	+1.4	No
Academy Avenue (South of Butler Avenue)	63.2	64.6	+1.4	No
Academy Avenue (North of California Avenue)	63.2	64.6	+1.4	No
Academy Avenue (South of California Avenue)	63.2	64.7	+1.5	No
Academy Avenue (North of Geary Avenue)	63.2	64.7	+1.5	No
Academy Avenue (South of Geary Avenue)	63.2	64.6	+1.4	No
Academy Avenue (North of Florence Avenue)	63.3	64.7	+1.4	No
Academy Avenue (South of Florence Avenue)	63.4	64.7	+1.3	No
Academy Avenue (North of Church Avenue)	63.4	64.7	+1.3	No
Academy Avenue (South of Church Avenue)	63.0	64.2	+1.2	No
SR 180 (West of Academy Avenue)	68.2	69.3	+1.1	No
SR 180 (East of Academy Avenue)	67.9	68.0	+0.1	No
SR 180 (West of Bethel Avenue)	69.2	69.8	+0.6	No
SR 180 (East of Bethel Avenue)	68.1	68.6	+0.5	No
Butler Avenue (West of Academy Avenue)	---	54.2	---	No
Butler Avenue (East of Academy Avenue)	45.0	46.1	+1.1	No
California Avenue (West of Academy Avenue)	---	49.5	---	No
California Avenue (East of Academy Avenue)	49.2	49.7	+0.5	No
Geary Avenue (East of Academy Avenue)	39.6	42.6	+3.0	No
Florence Avenue (East of Academy Avenue)	48.3	48.9	+0.6	No
Church Avenue (East of Academy Avenue)	54.5	55.1	+0.6	No
Church Avenue (West of Bethel Avenue)	52.4	52.4	0.0	No
Church Avenue (East of Bethel Avenue)	55.1	55.6	+0.5	No
Bethel Avenue (North of SR 180)	53.8	54.5	+0.7	No
Bethel Avenue (South of SR 180)	60.5	62.7	+2.2	No
Bethel Avenue (North of Church Avenue)	60.0	60.8	+0.8	No
Bethel Avenue (South of Church Avenue	61.0	61.6	+0.6	No

[1]At a reference setback distance of 100 feet from roadway

[2]The Closest residence is approximately 175 feet from the Roadway, and traffic noise exposure would be below 65 dB L_{dn}.

Source: WJV Acoustics, Inc.

TABLE X

COMPARISON OF "NO PROJECT" AND "PLUS PROJECT" SCENARIOS
TRAFFIC NOISE EXPOSURE-CUMULATIVE 2035 CONDITIONS
NORTH ACADEMY CORRIDOR MASTER PLAN

Roadway Name	L_{dn}, dB[1]		Change	Significant Impact?
	No Project	Plus Project		
Academy Avenue (North of SR 180)	65.4	65.8	+0.4	No
Academy Avenue (South of SR 180)	65.8	67.1	+1.3	No
Academy Avenue (North of Butler Avenue)	65.9	66.7	+0.8	No
Academy Avenue (South of Butler Avenue)	65.9	66.7	+0.8	No
Academy Avenue (North of California Avenue)	66.0	66.9	+0.9	No
Academy Avenue (South of California Avenue)	66.2	67.0	+0.8	No
Academy Avenue (North of Geary Avenue)	65.9	66.7	+0.8	No
Academy Avenue (South of Geary Avenue)	65.9	66.7	+0.8	No
Academy Avenue (North of Florence Avenue)	65.8	66.8	+1.0	No
Academy Avenue (South of Florence Avenue)	66.0	66.8	+0.8	No
Academy Avenue (North of Church Avenue)	66.0	66.9	+0.9	No
Academy Avenue (South of Church Avenue)	65.6	66.3	+0.7	No
SR 180 (West of Academy Avenue)	69.9	70.7	+0.8	No
SR 180 (East of Academy Avenue)	69.7	69.8	+0.1	No
SR 180 (West of Bethel Avenue)	70.6	71.0	+0.4	No
SR 180 (East of Bethel Avenue)	69.4	69.7	+0.3	No
Butler Avenue (West of Academy Avenue)	50.0	55.6	+5.6	No[2]
Butler Avenue (East of Academy Avenue)	49.4	49.8	+0.4	No
California Avenue (West of Academy Avenue)	54.7	55.8	+1.1	No
California Avenue (East of Academy Avenue)	53.0	53.5	+0.5	No
Geary Avenue (East of Academy Avenue)	42.4	44.3	+1.9	No
Florence Avenue (East of Academy Avenue)	50.6	50.9	+0.3	No
Church Avenue (East of Academy Avenue)	57.0	57.4	+0.4	No
Church Avenue (West of Bethel Avenue)	54.8	54.8	0.0	No
Church Avenue (East of Bethel Avenue)	57.7	58.0	+0.3	No
Bethel Avenue (North of SR 180)	56.7	57.1	+0.4	No
Bethel Avenue (South of SR 180)	62.7	64.2	+1.5	No
Bethel Avenue (North of Church Avenue)	63.7	64.0	+0.3	No
Bethel Avenue (South of Church Avenue	64.6	64.9	+0.3	No

[1]At a reference setback distance of 100 feet from roadway
[2]No existing noise-sensitive land uses on the roadway
Source: WJV Acoustics, Inc.

A significant noise impact is considered to occur when there is a significant increase in ambient noise levels due to the project or if the project results in noise levels which exceed the City's noise level standards at existing noise-sensitive land uses. Reference to Table IX and Table X indicate that the increases in project-related traffic noise exposure would not be expected to result in a significant impact along any roadways in the project vicinity. It should be noted, noise levels described in Table IX and Table X are provided at a reference distance of 100 feet from the roadways, and do not take into account site-specific acoustical conditions such as shielding. While some noise levels described in Table IX and Table X do exceed 65 dB L_{dn} along some of the analyzed roadways (at a 100-foot reference setback distance) the exceedances of 65 dB L_{dn} would occur without the project, and are not the result of the project. Therefore, the project would not result in a significant impact as a result of an increase in project-related traffic noise exposure.

b. Project Noise Impacts from Operational On-Site Sources (Less Than Significant With Mitigation)

The project would include commercial and retail land use designations. The actual locations and types of retail and commercial activities that could occur within the project site were not known at the time this analysis was prepared. This section provides a general, qualitative discussion of noise sources and noise levels that could occur as a result of commercial and retail land use activities.

Sources of operational noise from commercial and retail land uses would typically include parking lot vehicle movements, truck movements, mechanical/HVAC systems, fast-food restaurant drive-thru speakers, loading dock activities and trash compactors. Noise levels associated with such sources should be assessed when project-specific details are available in regards to proposed tenants of commercial and retail land use spaces. Noise levels associated with such activities, at a reference distance of 100 feet from the noise source, can be generalized as follows:

- Passing car in parking lot: 55-60 dB
- HVAC equipment: 50-70 dB
- Fast-food drive thru: 50-55 dB
- Loading dock activities: 70-80 dB
- Trash compactor: 50-55 dB
- Truck movements: 60-70 dB
- Idling refrigerated truck trailers: 50-55 dB

All commercial and retail activities within the proposed project site should comply with the City's applicable noise level standards. Once specific land uses have been identified and proposed, a detailed acoustical analysis should be prepared by a qualified acoustical consultant if noise impacts are expected to occur. The acoustical analysis should identify project related noise levels as they may affect nearby noise-sensitive land uses, and should provide appropriate mitigation measures to be applied to ensure compliance with the City's noise level standards. Appropriate mitigation measures may include the following:

- Appropriate project site planning and design
- Sound walls or acoustic barriers
- Limited hours of operation

c. Noise Impacts to On-Site Proposed Noise-Sensitive Land Uses (Less Than Significant With Mitigation)

The project would include a variety of new residential land uses which may have the potential to be exposed to transportation and non-transportation noise levels that could exceed the City's applicable noise level standards. The location, design and types of residential products were not known at the time this analysis was prepared. A detailed acoustical analysis should be prepared by a qualified acoustical consultant once site-specific details are proposed for new residential land uses within the Master Plan area. Appropriate mitigation measures should be incorporated into project design to ensure new noise-sensitive land uses are not exposed to noise levels that exceed the City's applicable noise level standards. Appropriate mitigation measures may include the following:

- Appropriate project site planning and design
- Sound walls or acoustic barriers
- Noise insulating construction measures
- Increased setbacks from roadways

d. Noise From Construction (Less Than Significant With Mitigation)

Construction noise could occur at various locations within the project area through the demolition and build-out period(s). Table XI provides typical construction-related noise levels at reference distances of 100 feet, 200 feet, 300 feet and 500 feet.

Construction noise is not usually considered to be a significant impact if construction is limited to the daytime hours and construction equipment is adequately maintained and muffled. Additionally, construction activities should be restricted as described in Section 2.b of this report.

TABLE XI

TYPICAL CONSTRUCTION EQUIPMENT MAXIMUM NOISE LEVELS, dBA

Type of Equipment	100 Ft	200 Ft.	300 Ft.	500 Ft.
Backhoe	72	66	62	58
Concrete Saw	84	78	74	70
Crane	75	69	65	61
Excavator	75	69	65	61
Front End Loader	73	67	63	59
Jackhammer	83	77	73	69
Paver	71	65	61	57
Pneumatic Tools	79	73	69	65
Dozer	76	70	66	62
Rollers	74	68	64	60
Trucks	80	74	70	66
Pumps	74	68	64	60
Scrapers	81	75	71	67
Portable Generators	74	68	64	60
Front Loader	80	74	70	66
Backhoe	80	74	70	66
Excavator	80	74	70	66
Grader	80	74	70	66

Source: FHWA
Noise Control for Buildings and Manufacturing Plants, Bolt, Beranek & Newman, 1987

d. Vibration Impacts (Less Than Significant)

The dominant sources of man-made vibration are sonic booms, blasting, pile driving, pavement breaking, demolition, diesel locomotives, and rail-car coupling. Vibration from construction activities could be detected at the closest sensitive land uses, especially during movements by heavy equipment or loaded trucks and during some paving activities. Typical vibration levels at distance of 25 feet, 100 feet and 300 feet are summarized by Table XII.

TABLE XII

TYPICAL VIBRATION LEVELS DURING CONSTRUCTION

	PPV (in/sec)		
Equipment	**@ 25´**	**@ 100´**	**@ 300´**
Bulldozer (Large)	0.09	0.011	0.006
Bulldozer (Small)	0.003	0.0004	0.00019
Loaded Truck	0.08	0.01	0.005
Jackhammer	0.04	0.005	0.002
Vibratory Roller	0.2	.03	0.013
Loaded Trucks	0.08	.01	0.006

Source: *Caltrans*

Table XII indicates that the equipment with the highest potential vibration levels would be a vibratory roller. While in use, a roller could produce vibration levels of approximately 0.03 PPV (in/sec) at a distance of 100 feet. As described in Table IV and Table V, such levels would not be expected to cause damage to any of the described building types and would be "barely noticeable" at the closest residence if the equipment was used continuously or frequently. Such levels are not considered to be a significant impact.

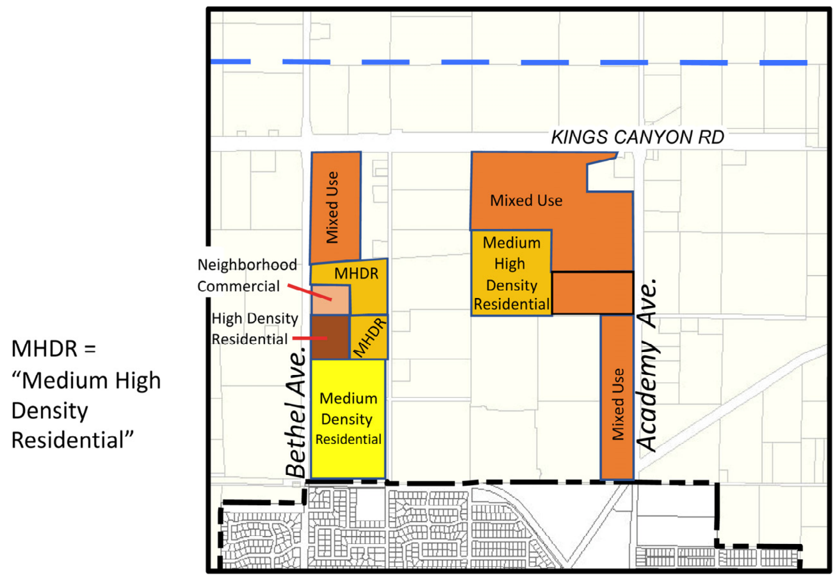
After full project build out, it is not expected that ongoing operational activities will result in any vibration impacts at nearby sensitive uses. Activities involved in trash bin collection could result in minor on-site vibrations as the bin is placed back onto the ground. Such vibrations would not be expected to be felt at the closest off-site sensitive uses.

5. IMPACT SUMMARY

The implementation of the North Academy Corridor Master Plan would not be expected to result in any significant increases in project-related traffic noise exposure at existing noise-sensitive land uses. Site specific noise impacts to proposed new residential land uses should be analyzed once specific project details are known or proposed. Additionally, potential noise impacts that may result from proposed commercial and retail land uses to existing off-site noise-sensitive land uses as well as proposed noise-sensitive land uses should be analyzed once specific details are known or proposed in regards to specific commercial and retail land uses. Construction noise and vibration is not expected to result in a significant impact if the construction guidelines and restrictions provided in the City of Sanger GUP are imposed.

FIGURE 1: NORTH ACADEMY CORRIDOR MASTER PLAN PROJECT AREA

Proposed land use designation changes to parcels for Sanger General Plan and North Academy Corridor Master Plan



All other land use designations are unchanged

Acreage Changes (from previous draft land use map)

Total new "Mixed Use Retail" acres: 152.7 acres
Total new "Neighborhood Commercial" acres: 7.9 acres
Total new "Medium Density Residential" acres: 48 acres
Total new "Medium High Density Residential" acres: 16.5 acres
Total new "High Density Residential" acres: 4.1 acres

Table showing acreage adjustments by land use designation

Original "Proposed" Land Use Designation	Newly Proposed Land Use Designation	Acres Involved
General Commercial	Mixed Use Retail	54.2 acres
Highway Commercial	Mixed Use Retail	37.5
Medium Low Density Residential	Medium Density Residential	48.0
Medium Density Residential	Medium High Density Residential	16.5
Neighborhood Commercial	High Density Residential	4.1
High Density Residential	Neighborhood Commercial	7.9
Medium Density Residential	Mixed Use Retail	41.2
Medium Low Density Residential	Mixed Use Retail	19.8

FIGURE 2: PROJECT VICINITY AND AMBIENT NOISE MONITORING SITES

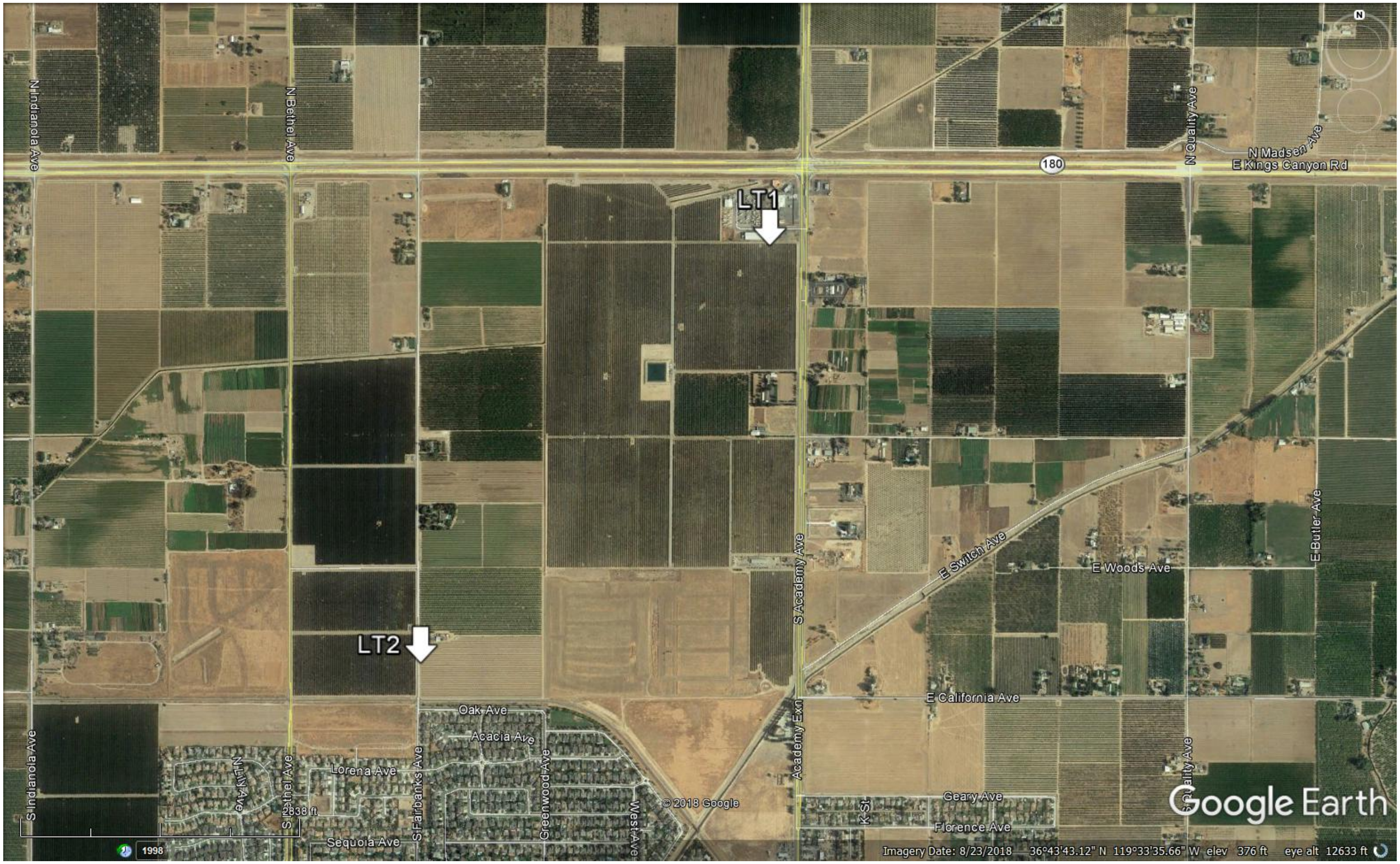


FIGURE 3: HOURLY NOISE LEVELS AT SITE LT1

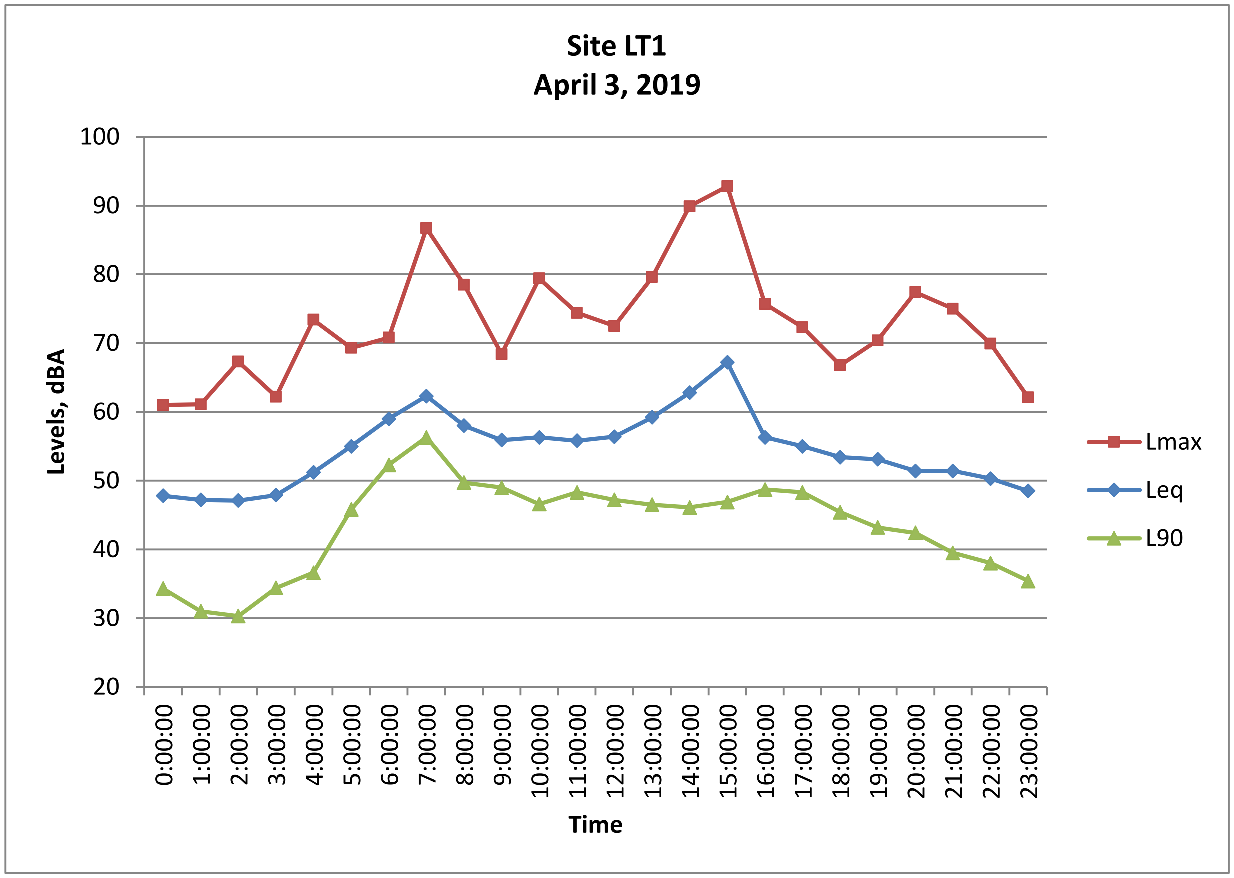


FIGURE 4: AMBIENT NOISE MONITORING SITE LT1

FIGURE 5: HOURLY NOISE LEVELS AT SITE LT2

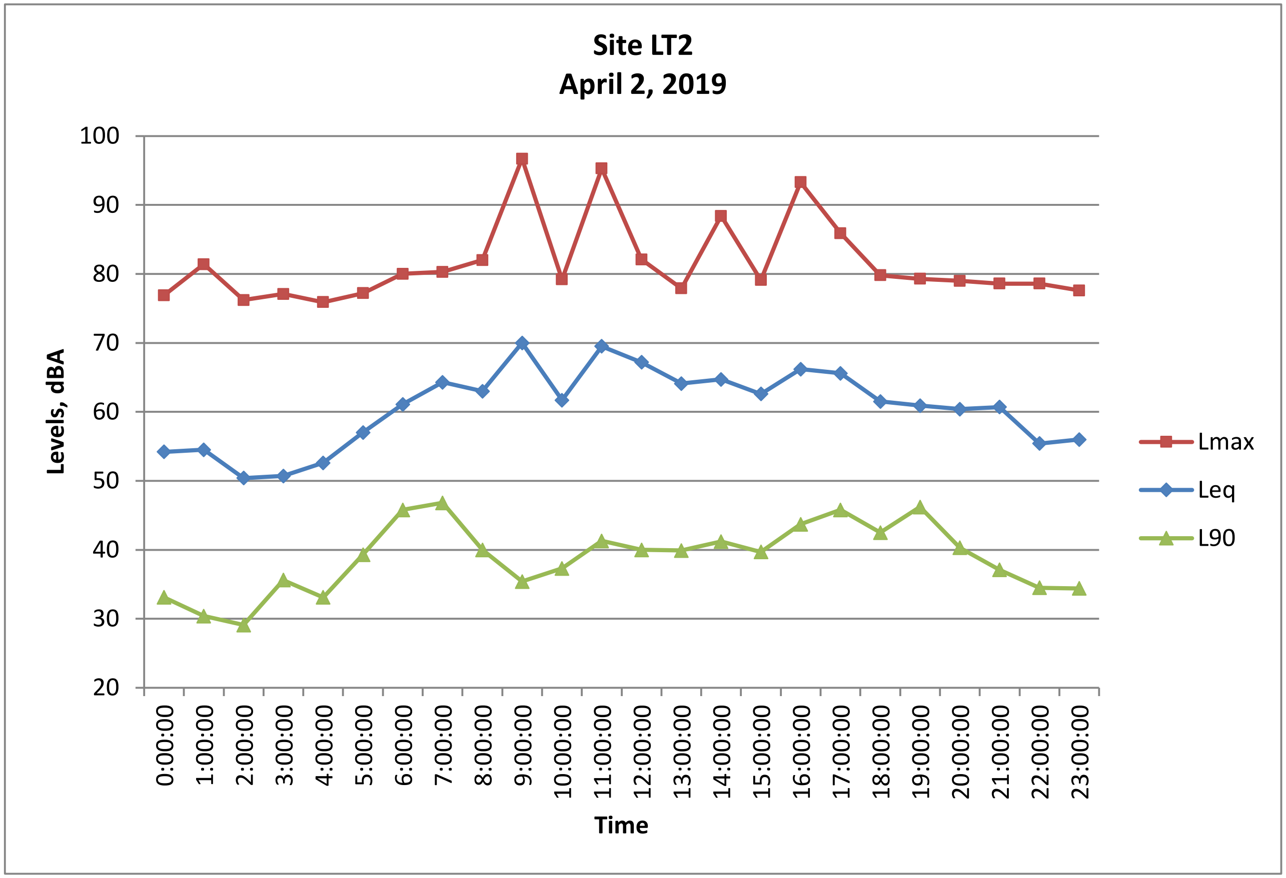


FIGURE 6: AMBIENT NOISE MONITORING SITE LT2

APPENDIX A-1

ACOUSTICAL TERMINOLOGY

AMBIENT NOISE LEVEL: The composite of noise from all sources near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.

CNEL: Community Noise Equivalent Level. The average equivalent sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night before 7:00 a.m. and after 10:00 p.m.

DECIBEL, dB: A unit for describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).

DNL/L_{dn}: Day/Night Average Sound Level. The average equivalent sound level during a 24-hour day, obtained after addition of ten decibels to sound levels in the night after 10:00 p.m. and before 7:00 a.m.

L_{eq}: Equivalent Sound Level. The sound level containing the same total energy as a time varying signal over a given sample period. L_{eq} is typically computed over 1, 8 and 24-hour sample periods.

NOTE: The CNEL and DNL represent daily levels of noise exposure averaged on an annual basis, while L_{eq} represents the average noise exposure for a shorter time period, typically one hour.

L_{max}: The maximum noise level recorded during a noise event.

L_n: The sound level exceeded "n" percent of the time during a sample interval (L_{90}, L_{50}, L_{10}, etc.). For example, L_{10} equals the level exceeded 10 percent of the time.

ACOUSTICAL TERMINOLOGY

NOISE EXPOSURE CONTOURS: Lines drawn about a noise source indicating constant levels of noise exposure. CNEL and DNL contours are frequently utilized to describe community exposure to noise.

NOISE LEVEL REDUCTION (NLR): The noise reduction between indoor and outdoor environments or between two rooms that is the numerical difference, in decibels, of the average sound pressure levels in those areas or rooms. A measurement of Anoise level reduction" combines the effect of the transmission loss performance of the structure plus the effect of acoustic absorption present in the receiving room.

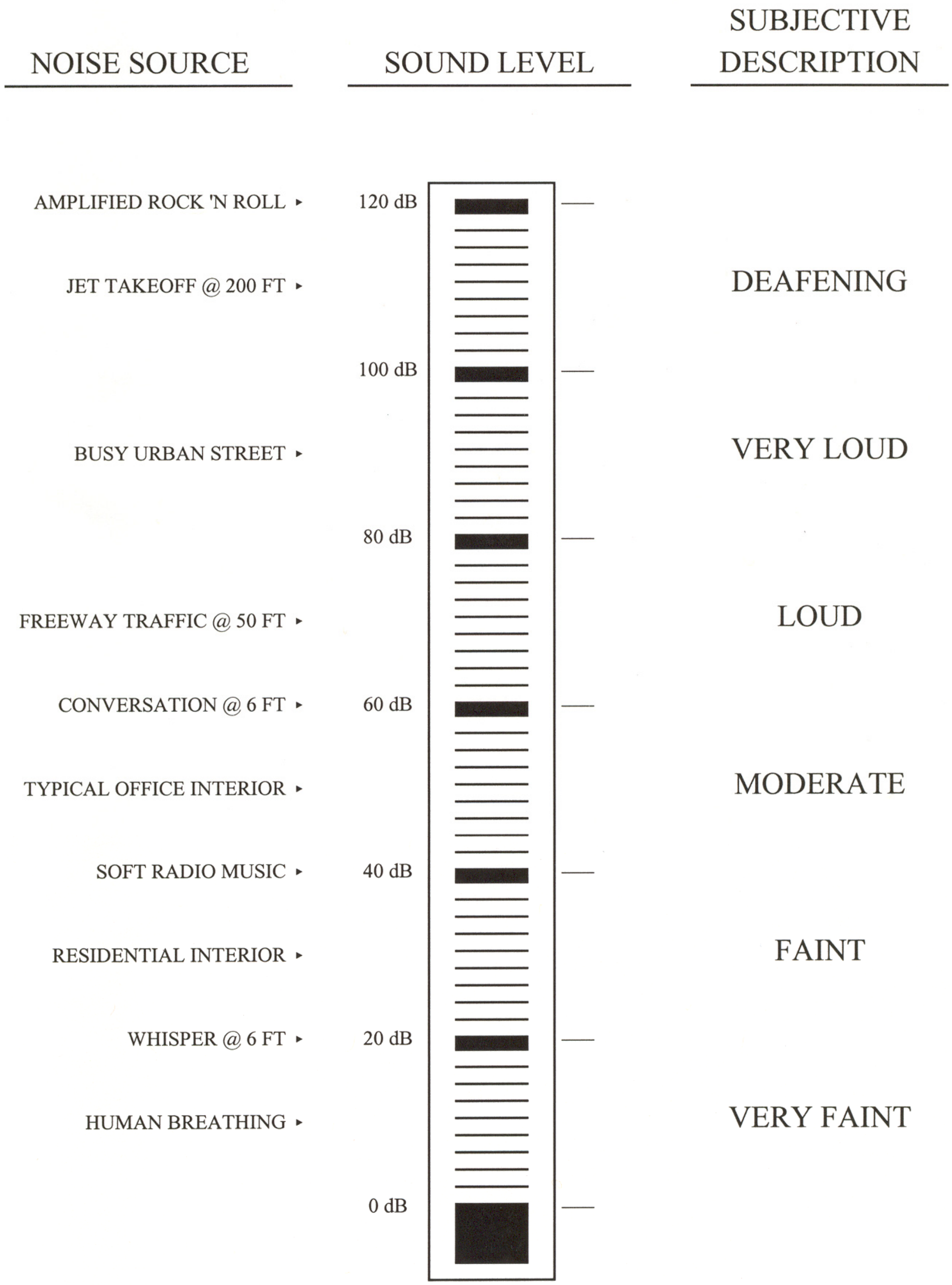
SEL or SENEL: Sound Exposure Level or Single Event Noise Exposure Level. The level of noise accumulated during a single noise event, such as an aircraft overflight, with reference to a duration of one second. More specifically, it is the time-integrated A-weighted squared sound pressure for a stated time interval or event, based on a reference pressure of 20 micropascals and a reference duration of one second.

SOUND LEVEL: The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the response of the human ear and gives good correlation with subjective reactions to noise.

SOUND TRANSMISSION CLASS (STC): The single-number rating of sound transmission loss for a construction element (window, door, etc.) over a frequency range where speech intelligibility largely occurs.

APPENDIX B

EXAMPLES OF SOUND LEVELS



APPENDIX C

TRAFFIC NOISE MODELING ASSUMPTIONS

WJV Acoustics, Inc
FHWA-RD-77-108
Calculation Sheets
April 5, 2019

Project #: 16-009B
Description: Existing
Ldn/Cnel: Ldn
Site Type: Soft

Contour Levels (dB)								
60	65	70	75					

Segment	Roadway Name	Segment Description	ADT	%Day	%Evening	%Night	%Med	%Heavy	Speed	Distance	Offset
1	Academy	n/o SR180	8360	90		10	2	1	50	100	
2	Academy	s/o SR180	10460	90		10	2	1	50	100	
3	SR180	w/o Academy	16040	90		10	3.9	1.3	65	100	
4	SR180	e/o Academy	14720	90		10	3.9	1.3	65	100	
5	Academy	n/o Butler	10690	90		10	2	1	50	100	
6	Academy	s/o Bulter	10650	90		10	2	1	50	100	
7	Bulter	w/o Academy		90		10	2	1	35	100	
8	Bulter	e/o Academy	380	90		10	2	1	35	100	
9	Academy	n/o California	10670	90		10	2	1	50	100	
10	Academy	s/o California	10630	90		10	2	1	50	100	
11	California	w/o Academy		90		10	2	1	35	100	
12	California	e/o Academy	1000	90		10	2	1	35	100	
13	Academy	n/o Geary	10680	90		10	2	1	50	100	
14	Academy	s/o Geary	10680	90		10	2	1	50	100	
15	Geary	e/o Academy	110	90		10	2	1	35	100	
16	Academy	n/o Florence	10780	90		10	2	1	50	100	
17	Academy	s/o Florence	11140	90		10	2	1	50	100	
18	Florence	e/o Academy	820	90		10	2	1	35	100	
19	Academy	n/o Church	11140	90		10	2	1	50	100	
20	Academy	s/o Church	10070	90		10	2	1	50	100	
21	Church	e/o Academy	3350	90		10	2	1	35	100	
22	Bethel	n/o SR180	1580	90		10	2	1	45	100	
23	Bethel	s/o SR180	7430	90		10	2	1	45	100	
24	SR180	w/o Bethel	20200	90		10	3.9	1.3	65	100	
25	SR180	e/o Bethel	15650	90		10	3.9	1.3	65	100	
26	Bethel	n/o Church	6560	90		10	2	1	45	100	
27	Bethel	s/o Church	8240	90		10	2	1	45	100	
28	Church	w/o Bethel	2110	90		10	2	1	35	100	
29	Church	e/o Bethel	3850	90		10	2	1	35	100	

WJV Acoustics, Inc
FHWA-RD-77-108
Calculation Sheets
April 5, 2019

Project #: 16-009B
Description: Existing+project
Ldn/Cnel: Ldn
Site Type: Soft

Contour Levels (dB)	60	65	70	75

Segment	Roadway Name	Segment Description	ADT	%Day	%Evening	%Night	%Med	%Heavy	Speed	Distance	Offset
1	Academy	n/o SR180	9910	90		10	2	1	50	100	
2	Academy	s/o SR180	17110	90		10	2	1	50	100	
3	SR180	w/o Academy	20480	90		10	3.9	1.3	65	100	
4	SR180	e/o Academy	15380	90		10	3.9	1.3	65	100	
5	Academy	n/o Butler	14770	90		10	2	1	50	100	
6	Academy	s/o Bulter	14520	90		10	2	1	50	100	
7	Bulter	w/o Academy	3180	90		10	2	1	35	100	
8	Bulter	e/o Academy	490	90		10	2	1	35	100	
9	Academy	n/o California	14590	90		10	2	1	50	100	
10	Academy	s/o California	14830	90		10	2	1	50	100	
11	California	w/o Academy	1070	90		10	2	1	35	100	
12	California	e/o Academy	1110	90		10	2	1	35	100	
13	Academy	n/o Geary	14920	90		10	2	1	50	100	
14	Academy	s/o Geary	14780	90		10	2	1	50	100	
15	Geary	e/o Academy	220	90		10	2	1	35	100	
16	Academy	n/o Florence	14880	90		10	2	1	50	100	
17	Academy	s/o Florence	15130	90		10	2	1	50	100	
18	Florence	e/o Academy	930	90		10	2	1	35	100	
19	Academy	n/o Church	15170	90		10	2	1	50	100	
20	Academy	s/o Church	13500	90		10	2	1	50	100	
21	Church	e/o Academy	3900	90		10	2	1	35	100	
22	Bethel	n/o SR180	1880	90		10	2	1	45	100	
23	Bethel	s/o SR180	12420	90		10	2	1	45	100	
24	SR180	w/o Bethel	23110	90		10	3.9	1.3	65	100	
25	SR180	e/o Bethel	17430	90		10	3.9	1.3	65	100	
26	Bethel	n/o Church	7980	90		10	2	1	45	100	
27	Bethel	s/o Church	9470	90		10	2	1	45	100	
28	Church	w/o Bethel	2110	90		10	2	1	35	100	
29	Church	e/o Bethel	4360	90		10	2	1	35	100	

WJV Acoustics, Inc
FHWA-RD-77-108
Calculation Sheets
April 5, 2019

Project #: 16-009B
Description: Cumulative
Ldn/Cnel: Ldn
Site Type: Soft

Contour Levels (dB)								
60	65	70	75					

Segment	Roadway Name	Segment Description	ADT	%Day	%Evening	%Night	%Med	%Heavy	Speed	Distance	Offset
1	Academy	n/o SR180	17720	90		10	2	1	50	100	
2	Academy	s/o SR180	19460	90		10	2	1	50	100	
3	SR180	w/o Academy	23610	90		10	3.9	1.3	65	100	
4	SR180	e/o Academy	22570	90		10	3.9	1.3	65	100	
5	Academy	n/o Butler	19790	90		10	2	1	50	100	
6	Academy	s/o Bulter	19960	90		10	2	1	50	100	
7	Bulter	w/o Academy	1210	90		10	2	1	35	100	
8	Bulter	e/o Academy	1040	90		10	2	1	35	100	
9	Academy	n/o California	20410	90		10	2	1	50	100	
10	Academy	s/o California	21300	90		10	2	1	50	100	
11	California	w/o Academy	3540	90		10	2	1	35	100	
12	California	e/o Academy	2390	90		10	2	1	35	100	
13	Academy	n/o Geary	19570	90		10	2	1	50	100	
14	Academy	s/o Geary	19550	90		10	2	1	50	100	
15	Geary	e/o Academy	210	90		10	2	1	35	100	
16	Academy	n/o Florence	19520	90		10	2	1	50	100	
17	Academy	s/o Florence	20070	90		10	2	1	50	100	
18	Florence	e/o Academy	1370	90		10	2	1	35	100	
19	Academy	n/o Church	20070	90		10	2	1	50	100	
20	Academy	s/o Church	18440	90		10	2	1	50	100	
21	Church	e/o Academy	6050	90		10	2	1	35	100	
22	Bethel	n/o SR180	3120	90		10	2	1	45	100	
23	Bethel	s/o SR180	12250	90		10	2	1	45	100	
24	SR180	w/o Bethel	27750	90		10	3.9	1.3	65	100	
25	SR180	e/o Bethel	20760	90		10	3.9	1.3	65	100	
26	Bethel	n/o Church	15310	90		10	2	1	45	100	
27	Bethel	s/o Church	19020	90		10	2	1	45	100	
28	Church	w/o Bethel	3670	90		10	2	1	35	100	
29	Church	e/o Bethel	7100	90		10	2	1	35	100	

WJV Acoustics, Inc
FHWA-RD-77-108
Calculation Sheets
April 5, 2019

Project #: 16-009B
Description: Cumulative+project
Ldn/Cnel: Ldn
Site Type: Soft

Contour Levels (dB): 60 | 65 | 70 | 75

Segment	Roadway Name	Segment Description	ADT	%Day	%Evening	%Night	%Med	%Heavy	Speed	Distance	Offset
1	Academy	n/o SR180	19270	90		10	2	1	50	100	
2	Academy	s/o SR180	26110	90		10	2	1	50	100	
3	SR180	w/o Academy	28050	90		10	3.9	1.3	65	100	
4	SR180	e/o Academy	23230	90		10	3.9	1.3	65	100	
5	Academy	n/o Butler	23870	90		10	2	1	50	100	
6	Academy	s/o Bulter	23830	90		10	2	1	50	100	
7	Bulter	w/o Academy	4390	90		10	2	1	35	100	
8	Bulter	e/o Academy	1150	90		10	2	1	35	100	
9	Academy	n/o California	24730	90		10	2	1	50	100	
10	Academy	s/o California	25500	90		10	2	1	50	100	
11	California	w/o Academy	4610	90		10	2	1	35	100	
12	California	e/o Academy	2700	90		10	2	1	35	100	
13	Academy	n/o Geary	23780	90		10	2	1	50	100	
14	Academy	s/o Geary	23650	90		10	2	1	50	100	
15	Geary	e/o Academy	320	90		10	2	1	35	100	
16	Academy	n/o Florence	24330	90		10	2	1	50	100	
17	Academy	s/o Florence	24060	90		10	2	1	50	100	
18	Florence	e/o Academy	1480	90		10	2	1	35	100	
19	Academy	n/o Church	24870	90		10	2	1	50	100	
20	Academy	s/o Church	21870	90		10	2	1	50	100	
21	Church	e/o Academy	6600	90		10	2	1	35	100	
22	Bethel	n/o SR180	3420	90		10	2	1	45	100	
23	Bethel	s/o SR180	17240	90		10	2	1	45	100	
24	SR180	w/o Bethel	30660	90		10	3.9	1.3	65	100	
25	SR180	e/o Bethel	22540	90		10	3.9	1.3	65	100	
26	Bethel	n/o Church	16730	90		10	2	1	45	100	
27	Bethel	s/o Church	20250	90		10	2	1	45	100	
28	Church	w/o Bethel	3670	90		10	2	1	35	100	
29	Church	e/o Bethel	7610	90		10	2	1	35	100	

Appendix D

Transportation Impact Analysis Report

North Academy Corridor Master Plan

Transportation Impact Analysis Report

Prepared for:

Collins & Schoettler Planning Consultants

Prepared by:

GHD

North Academy Corridor Master Plan

Transportation Impact Analysis Report

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April 2019

BST No. 11152150
2449RPT002.DOCX

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Introduction

This report has been prepared by GHD to provide a Transportation Impact Analysis Report (TIAR) for the proposed annexation of approximately 300 acres on both sides of North Academy and North Bethel Avenues between the current City of Sanger City limits boundary (along California Avenue alignment) north to State Route 180 (Kings Canyon Road) in Fresno County, California. Figure 1 identifies the North Academy Corridor Master Plan Area. The term "project" as used in this report refers to buildout of the proposed North Academy Corridor Master Plan.

The City of Sanger is currently undergoing a General Plan Update (GPU), which is scheduled for adoption in summer of 2019. In an effort to increase is retail land use opportunities, the City of Sanger wishes to extend its boundary northward to include the addition of approximately 7 acres of Neighborhood Commercial, 163 acres of Mixed-Use, 65 acres of Medium High Density Residential, 54 acres of Medium Density Residential, an 11 acres of High Density Residential uses. Additional acreage will be included used for storm drain facilities to accommodate planned growth.

Consistent with CEQA guidelines, the following traffic scenarios are evaluated as part of this TIAR:

- *Existing* conditions
- *Existing plus Project* conditions
- *Cumulative No Project* conditions
- *Cumulative plus Project* conditions

Existing conditions quantify the current traffic operations at the study locations. Traffic counts were taken on Thursday, January 11, 2018, and on Tuesday, March 5, 2019, by Metro Traffic Data, Inc., to establish typical weekday traffic conditions during the AM and PM peak hours. These peak hour turning movement counts (intersections) and 24-hour volume reports (roadway segments) were conducted during "clear" weather conditions, while schools were in session and during a non-holiday week.

Existing plus Project conditions is an analysis scenario in which traffic impacts associated with buildout of the proposed project are investigated in comparison to the *Existing* conditions scenario. The project-generated peak hour volumes were added to the *Existing* conditions volumes to obtain the *Existing plus Project* traffic volumes.

Cumulative No Project conditions refers to a future analysis scenario that would consider planned growth of the City of Sanger's General Plan and regional growth. The volumes were developed using Fresno Council of Governments (Fresno COG) Regional Travel Demand Forecast Model. No growth of the project is assumed for this scenario.

Cumulative *plus Project* conditions is an analysis scenario in which traffic impacts associated with buildout of the proposed project are investigated in comparison to the Cumulative *No Project* conditions scenario. The project-generated peak hour volumes were added to the Cumulative *No Project* condition volumes to obtain the Cumulative *plus Project* traffic volumes.

Study Area

The study area is shown on Figure 1, and includes primary local arterials, collectors and city streets. In addition, State Route 180 (Kings Canyon Road) is included in this analysis.

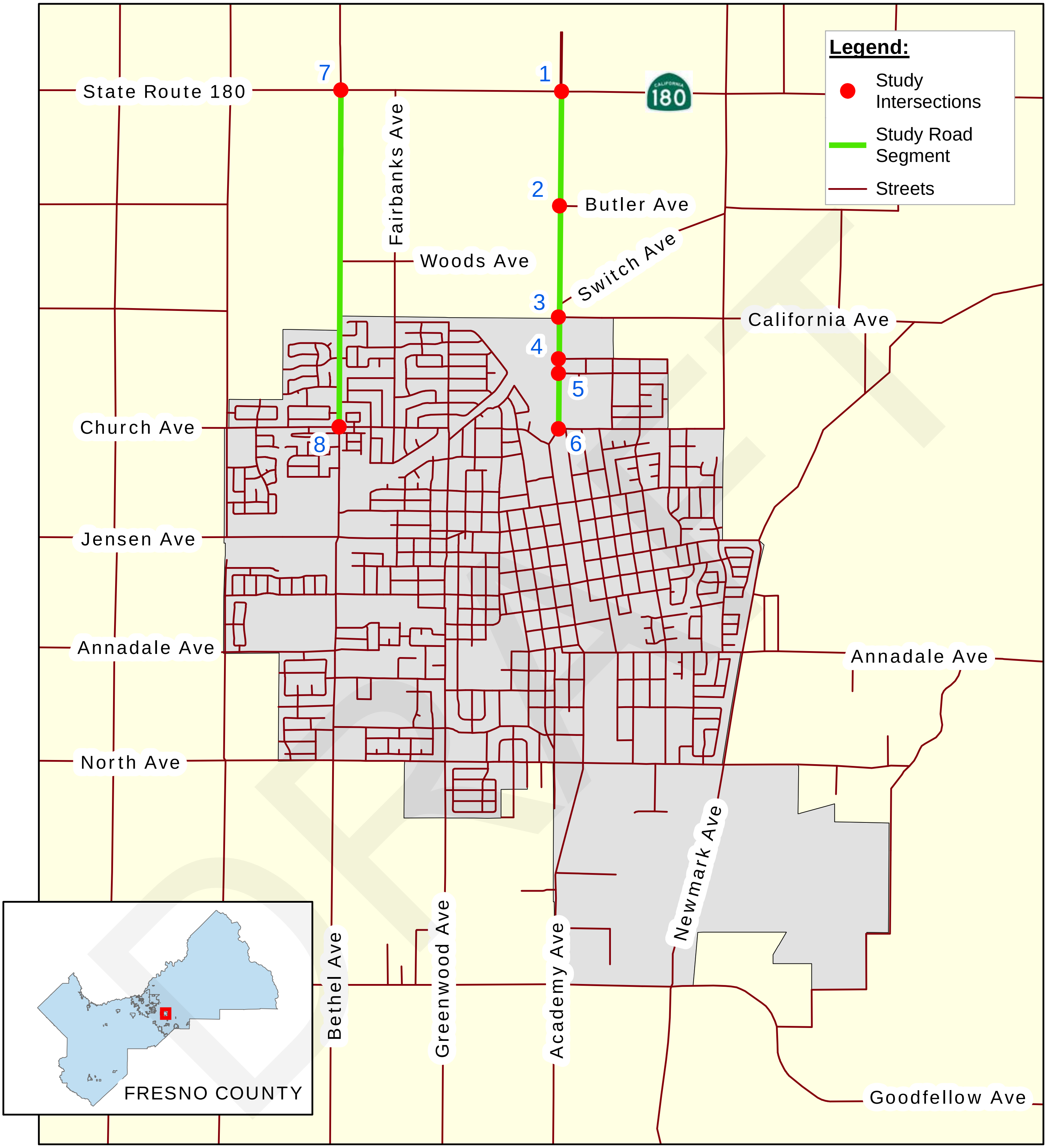

FIGURE 1

Project No. 11152150
Revision No. -
Date: 3/28/2019

City of Sanger
North Academy Corridor Master Plan

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Print date: 01 Apr 2019 - 13:46

Data source: . Created by: jramirez2

Study Intersections

The following major intersections were selected for analysis on the basis of providing primary local and regional access to and from the project site:

1. State Route 180 (Kings Canyon Road)/Academy Avenue
2. Butler Avenue/Academy Avenue
3. California Avenue/Academy Avenue
4. Geary Avenue/Academy Avenue
5. Florence Avenue/Academy Avenue
6. Church Avenue/Academy Avenue
7. State Route 180 (Kings Canyon Road)/Bethel Avenue
8. Church Avenue/Bethel Avenue

Study Roadway Segments

In addition, the following roadway segments were selected for analysis:

1. State Route 180 (Kings Canyon Road) between Bethel Avenue and Academy Avenue
2. State Route 180 (Kings Canyon Road) between Academy Avenue and Newmark Avenue
3. Academy Avenue between Church Avenue and Butler Avenue
4. Academy Avenue between Butler Avenue and State Route 180 (Kings Canyon Road)
5. Bethel Avenue between Church Avenue and Florence Avenue
6. Bethel Avenue between Florence Avenue and State Route 180 (Kings Canyon Road)

Existing Conditions

Existing conditions analysis establishes the baseline traffic conditions. *Existing* conditions is the analysis scenario in which current operations is quantified at the study intersections.

Transportation System

State Route 180 (Kings Canyon Road) is a regional highway facility that is located north of Sanger. This route begins in Fresno and heads east to Sequoia/Kings Canyon National Parks. Near Sanger, State Route 180 is a four-lane divided expressway that carries an annual average daily traffic (AADT) count of approximately 16,200.[1] Currently, highway commercial services are provided at the State Route 180/Academy Avenue intersection for regional travelers and local residents. The future concept for State Route 180/Academy Avenue includes a modern interchange.

Academy Avenue is a north/south arterial located in central Sanger and bisects the community. Academy Avenue is a regional route in Fresno County that extends from the State Route 99 in the south to State Route 168 in the north. Through the City of Sanger, Academy Avenue is a four-lane divided and undivided arterial between Central Avenue and California Avenue. North

[1] 2017, State of California, Department of Transportation, Traffic Operations Division. Average calculated between Back AADT and Ahead AADT at Post Mile 71.61.

of the city limits, Academy Avenue extends approximately one (1) mile to State Route 180, which includes the primary study area of this project. Class II bike lanes exist or are proposed along this corridor within the city limits and rural sections of Fresno County. Academy Avenue serves many land uses in the Sanger area, including residential, commercial, retail, industrial, medical and agricultural.

Bethel Avenue is a north/south aligned arterial generally consisting of a four-lane divided roadway between North and Florence Avenues in western Sanger. North of Florence Avenue, Bethel Avenue is a two-lane roadway and continues northward and extends through State Route 180. In the General Plan, Bethel Avenue is designated as a future Principal Arterial within the study area. Also a regional route in Fresno County, in its entirety, Bethel Avenue extends from State Route 99 (near Kamm Avenue) in the south to Ashlan Avenue in the north. In Sanger, Bethel Avenue serves a variety of residential, institutional (educational, religious), commercial, retail and industrial land uses.

Butler Avenue is currently a rural, two-lane road that extends from Academy Avenue east where it dead ends at Quality Avenue. Existing land uses on this street include single-family residences, light industrial and agricultural uses. However, in the future it is designated as a two-lane collector in the City of Sanger's Draft 2018 General Plan between Indianola Avenue and Quality Avenue. According to the City Standards, collector right-of-way widths range from 60 to 92 feet. This width would typically accommodate a minimum of two travel lanes and may include bike lanes, parking and sidewalks. A typical collector street cross section is shown below.

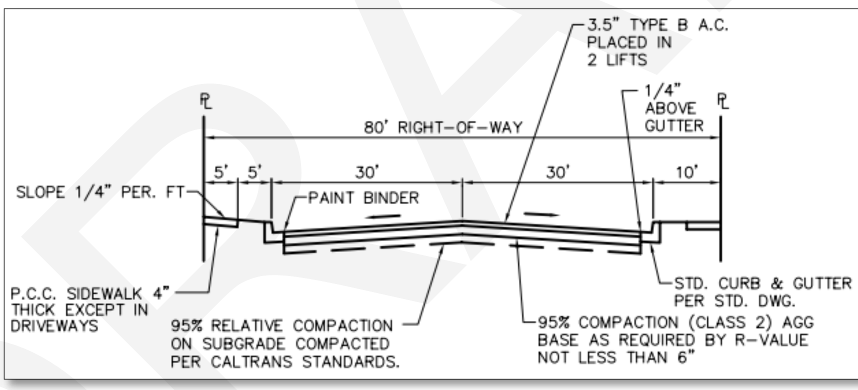

FIGURE 2: COLLECTOR STREET TYPICAL CROSS-SECTION

For this study, Butler Avenue is proposed to be extended to the west of Academy Avenue and improved to provide access to proposed future commercial development along the North Academy Avenue corridor.

California Avenue is an east/west aligned future arterial in the northern portion of Sanger. California Avenue is currently a two-lane, undivided roadway from McCall Avenue to Indianola Avenue in northwest Sanger and between Academy Avenue in central Sanger and Rainbow Avenue in eastern Sanger. California Avenue is planned to provide east/west travel in northern Sanger and will be constructed to arterial standards in the city limits (north of the railroad tracks) and fill in the existing gap between Indianola and Academy Avenues. However, the ultimate future alignment has not be determined. This roadway currently serves residential and agricultural land uses.

Geary Avenue and ***Florence Avenue*** are two-lane local streets that runs east-west from Academy Avenue east to Harrison Avenue. Both of these streets primarily serve single-family residences and are adjacent to agricultural lands. In addition, a community park is located south of Florence Avenue near Faller Avenue.

Church Avenue is an important east/west undivided two-lane collector that serves Sanger between Bethel Avenue and Greenwood Avenue and from Hill Avenue to Quality Avenue. With a pavement width of 56 feet, this route serves a school, residences, businesses and a church. As a result of the mixed land uses and wide road, sections along Church Avenue will provide Class II Bike Lanes. In addition, a two-way left-turn lane (TWLTL) and on-street parking are planned for this corridor.

Bicycle & Pedestrian Facilities

Currently, Academy Avenue is designated as a Class II Bike Lane between California Avenue and State Route 180. It is the only existing bike route within the study area, as shown in Figure 3 from the *City of Sanger General Plan*. However, when Butler and California Avenues are extended to include through trips across Academy Avenue, adequate right-of-way will be allow for future east-west bike lanes. Bethel Avenue is classified as a Class II Buffered Bike Lane north of California Avenue. Additionally, the *Fresno County Regional Active Transportation Plan* identifies a planned Class I Trail/Bikeway along the current irrigation ditch and within the current transmission line crossing diagonally through the study area.

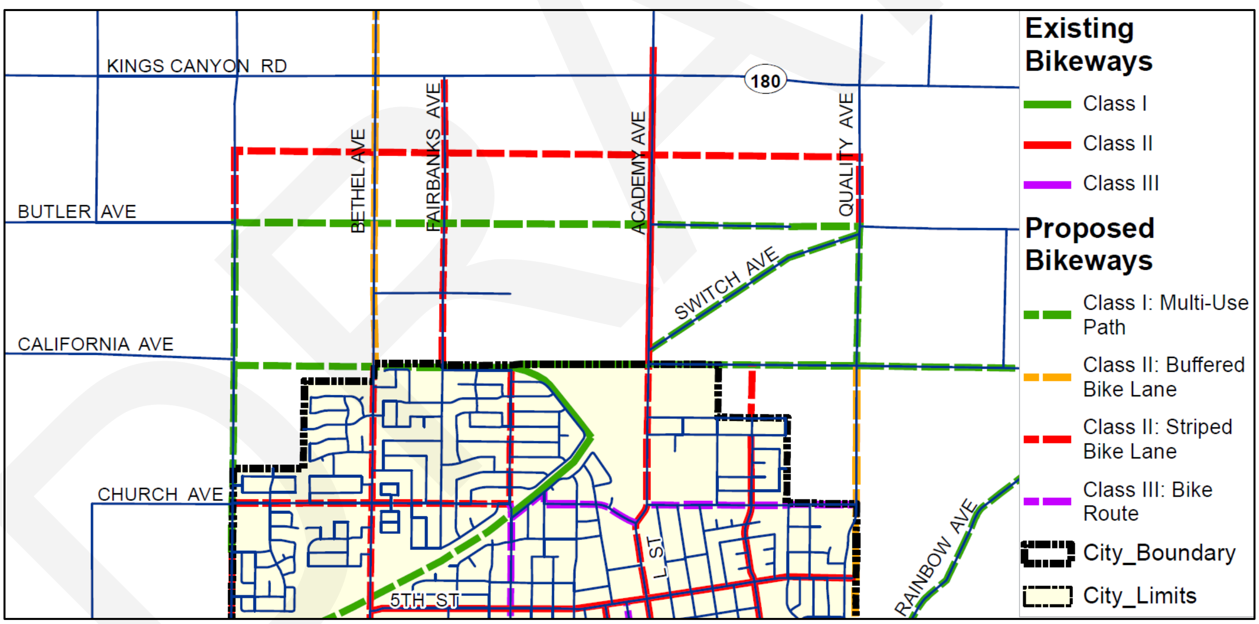

FIGURE 3: EXISTING BIKE MAP (PARTIAL)

Figure 4 identifies existing sidewalks and trails south of the study area. An existing trail is found adjacent to Oak Avenue/Acacia Avenue and several sidewalks are found within the city limits. An additional trail and sidewalks are proposed and shown in Figure 4.

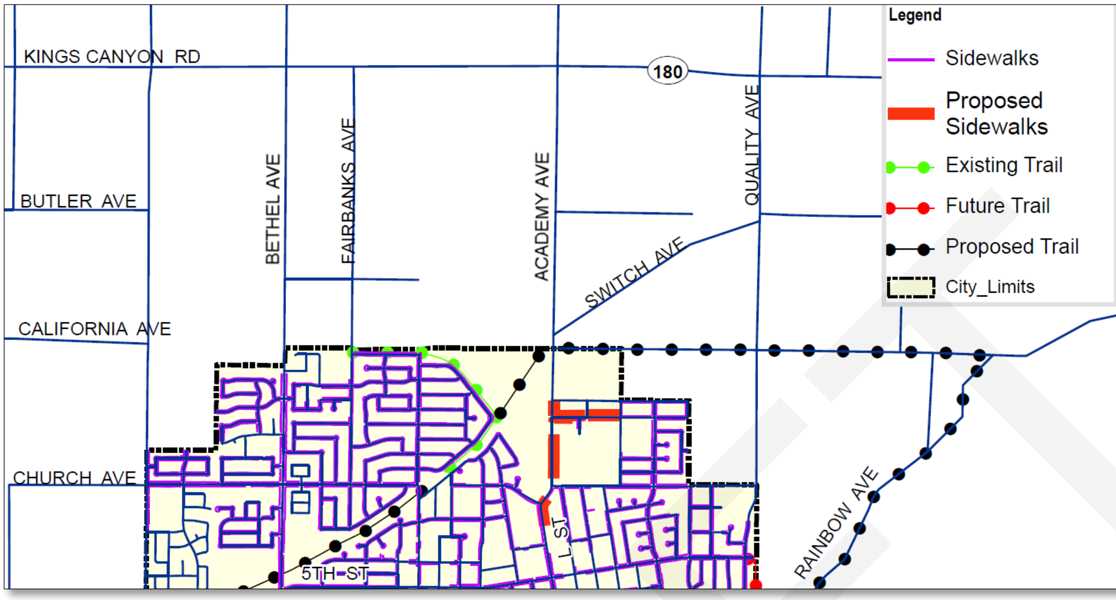

FIGURE 4: EXISTING SIDEWALK & TRAIL MAP (PARTIAL)

Transit

Limited transit routes/bus stops are found along the North Academy Avenue study area. In fact, Figure 5 shows that the nearest existing transit stop is located at City Hall (7th Street). However, as the study area is developed, there will be an opportunity to connect North Academy Avenue to other parts of the City and/or County as new destinations are developed.

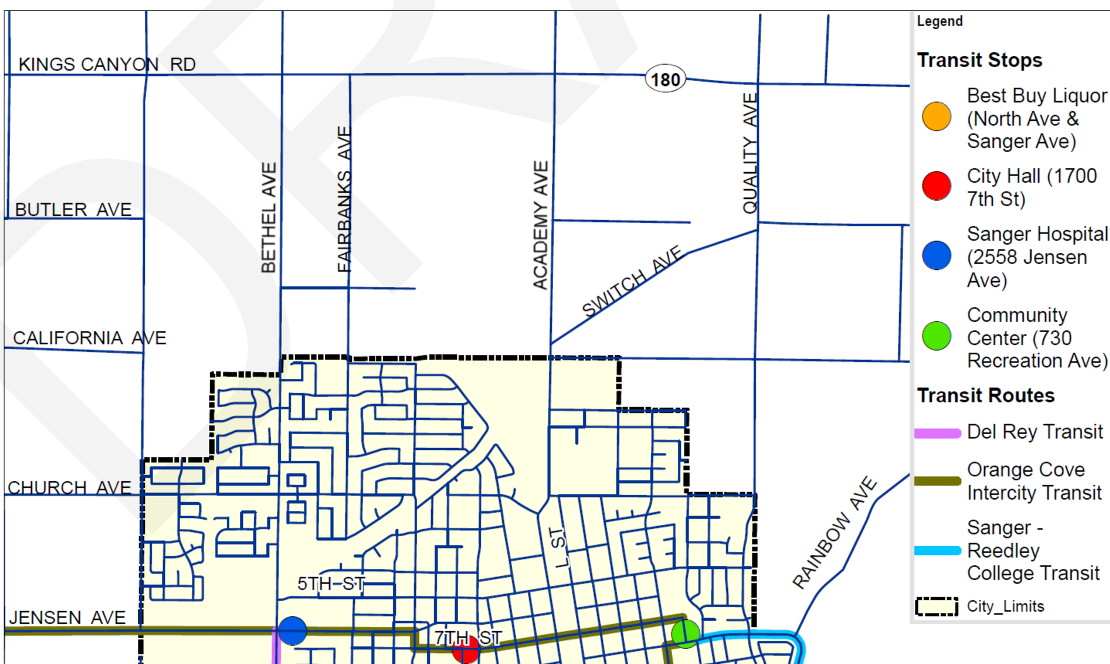

FIGURE 5: TRANSIT MAP (PARTIAL)

Existing Traffic Volumes

Intersection turning movement counts were collected on Thursday, January 11, 2018, and on Tuesday, March 5, 2019, at the study intersections during weekday AM (7:00 - 9:00 AM) and PM (4:00 - 6:00 PM) peak periods. Daily traffic counts along the Academy Avenue corridor were also collected on this day. The study area highway facilities along the State Route 180 mainline segments were evaluated using 2016 annual average daily traffic (AADT) counts collected from Caltrans.

Technical Analysis Parameters

This TIAR provides a "planning level" evaluation of traffic conditions, which is considered sufficient for CEQA/NEPA clearance purposes. The "planning level" evaluation incorporates appropriate heavy vehicle adjustment factors, peak-hour factors, and signal lost-time factors (as needed). LOS operations have been determined using the *Highway Capacity Manual (HCM), Sixth Edition* methodologies for determining intersection delay, incorporating the aforementioned factors. The following subsections outline the methodology and analysis parameters used to quantify traffic operations at study intersections.

Intersection LOS Methodologies

Levels of Service (LOS) have been calculated for all intersection control types using the methods documented in the Transportation Research Board Publication *HCM Sixth Edition.* Traffic operations have been quantified through the determination of "Level of Service" (LOS). LOS is a qualitative measure of traffic operating conditions, whereby a letter grade A through F is assigned to an intersection or roadway segment representing progressively worsening traffic conditions.

For signalized intersections and All-Way-Stop-Controlled (AWSC) intersection, the intersection delays and LOS are average values for all intersection movements. For Two-Way-Stop-Controlled (TWSC) intersections, the intersection delays and LOS is representative of those for the worst-case movement. LOS definitions for different types of intersection controls are outlined in Table 1. Average daily traffic (ADT) thresholds shown in Table 2 are based upon the HCM and are Fresno COG's currently adopted LOS methodology for roadway segments and utilized by the member agencies of Fresno COG, including the City of Sanger.

Synchro Modeling

The *Synchro 6th Edition* software suite by *Trafficware* has been used to implement the *HCM Sixth Edition* analysis methodologies. The peak hour capacity tables contained in this report present the intersection delay and LOS estimates as calculated using the *Synchro* software.

TABLE 1
LEVEL OF SERVICE (LOS) CRITERIA FOR INTERSECTIONS

Level of Service	Type of Flow	Delay	Maneuverability	Stopped Delay/Vehicle		
				Signalized	Un signalized	All-Way Stop
A	Stable Flow	Very slight delay. Progression is very favorable, with most vehicles arriving during the green phase not stopping at all.	Turning movements are easily made, and nearly all drivers find freedom of operation.	<10.0	<10.0	<10.0
B	Stable Flow	Good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.	Vehicle platoons are formed. Many drivers begin to feel somewhat restricted within groups of vehicles.	>10.0 and <20.0	>10.0 and <15.0	>10.0 and <15.0
C	Stable Flow	Higher delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant, although many still pass through the intersection without stopping.	Back-ups may develop behind turning vehicles. Most drivers feel somewhat restricted	>20.0 and <35.0	>15.0 and <25.0	>15.0 and <25.0
D	Approaching Unstable Flow	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volume-to-capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	Maneuverability is severely limited during short periods due to temporary back-ups.	>35.0 and <55.0	>25.0 and <35.0	>25.0 and <35.0
E	Unstable Flow	Generally considered to be the limit of acceptable delay. Indicative of poor progression, long cycle lengths, and high volume-to-capacity ratios. Individual cycle failures are frequent occurrences.	There are typically long queues of vehicles waiting upstream of the intersection.	>55.0 and <80.0	>35.0 and <50.0	>35.0 and <50.0
F	Forced Flow	Generally considered to be unacceptable to most drivers. Often occurs with over saturation. May also occur at high volume-to-capacity ratios. There are many individual cycle failures. Poor progression and long cycle lengths may also be major contributing factors.	Jammed conditions. Back-ups from other locations restrict or prevent movement. Volumes may vary widely, depending principally on the downstream back-up conditions.	>80.0	>50.0	>50.0

References: Highway Capacity Manual, Sixth Edition

TABLE 2
LEVEL OF SERVICE (LOS) CRITERIA FOR ROADWAY SEGMENTS

Roadway Segment Type	Total Two-Way Average Daily Traffic (ADT)				
	LOS A	LOS B	LOS C	LOS D	LOS E
6-Lane Divided Freeway	42,000	64,800	92,400	111,600	120,000
4-Lane Divided Freeway	28,000	43,200	61,600	74,400	80,000
4-Lane Divided Expressway	23,670	28,130	30,800	37,200	40,000
6-Lane Divided Arterial (with left-turn lane)	32,000	38,000	43,000	49,000	54,000
4-Lane Divided Arterial (with left-turn lane)	22,000	25,000	29,000	32,500	36,000
4-Lane Undivided Arterial (no left-turn lane)	18,000	21,000	24,000	27,000	30,000
2-Lane Arterial (with left-turn lane)	11,000	12,500	14,500	16,000	18,000
2-Lane Arterial (no left-turn lane)	9,000	10,500	12,000	13,500	15,000
2-Lane Collector/Local Street	6,000	7,500	9,000	10,500	12,000

Notes:

All volumes are approximate and assume ideal roadway characteristics. Actual threshold volumes for each LOS listed above may vary depending on a variety of factors including curvature and grade, intersection or interchange spacing, driveway spacing, percentage of trucks and other heavy vehicles, travel lane widths, signal timing characteristics, on-street parking, volume of cross traffic and pedestrians, etc. Traffic exceeding LOS E thresholds is LOS F.

Reference: Highway Capacity Manual

Level of Service Standard

The *City of Sanger General Plan Circulation Element* has designated LOS "C" as the minimum acceptable LOS standard on city facilities. In this report, a peak-hour of LOS "C" is taken as the threshold for acceptable traffic operations at all study intersections. All intersection turning movement volumes and LOS worksheets will be provided in a separate Technical Appendix.

Although Caltrans has not designated a LOS standard, Caltrans' Guide for the Preparation of Traffic Impact Studies (December 2002) indicates that when the LOS of a State highway facility falls below the LOS "C/D" cusp in rural areas and the LOS "D/E" cusp in the Urban Areas, any additional traffic may have a significant impact. When existing State highway facilities are operating at higher levels of service than noted above, 20-year forecasts or general plan build-out analysis for the facility should be considered to establish equitable project contributions to local development impact fee programs that address cumulative traffic impacts.

Standards of Significance

To determine whether "significance" should be associated with unsignalized intersection LOS, a supplemental traffic signal warrant analysis was also performed. The signal warrant criteria employed for this study are presented in the *California Manual on Uniform Traffic Control Devices* (CAMUTCD). Specifically, this study utilized the Peak-Hour Warrant 3. Though utilization of this warrant may indicate that signalization would be required, the final decision to provide this improvement should be based on further studies utilizing the additional warrants presented in CAMUTCD.

Existing Conditions

Existing Intersection Operations

Existing AM and PM peak hour intersection traffic operations were quantified using the intersection lane geometrics and control (Figure 6) and existing peak hour volumes (Figure 7) and the existing. Table 7 contains a summary of the *Existing* conditions study intersections LOS results.

TABLE 3
EXISTING: INTERSECTION LEVEL OF SERVICE

#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met?[3]	Delay	LOS	Warrant Met?[3]
1	Academy Ave/Kings Canyon Rd (SR 180)	Signal	C	10.2	B	--	10.5	B	--
2	Academy Ave/Butler Ave	TWSC	C	14.4	B	No	14.1	B	No
3	Academy Ave/California Ave	TWSC	C	13.7	B	No	15.7	C	No
4	Academy Ave/Geary Ave	TWSC	C	10.3	B	No	10.0	B	No
5	Academy Ave/Florence Ave	TWSC	C	11.7	B	No	13.9	B	No
6	Academy Ave/Church Ave	TWSC	C	12.8	B	No	19.3	C	No
7	Bethel Ave/Kings Canyon Rd (SR 180)	Signal	C	13.1	B	--	13.5	B	--
8	Bethel Ave/Church Ave	Signal	C	10.6	B	--	6.0	B	--

Notes:
1. TWSC = Two Way Stop Control
2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for Signal
3. Warrant = Based on California MUTCD Warrant 3

As shown in Table 3, the study intersections operate at acceptable LOS “C” or better. In addition, none of the non-signalized intersections is currently meeting the California MUTCD Peak Hour Warrant 3 under *Existing* conditions.

NORTH

1,500 0 1,500

1 inch =1,500 ft.

CITY OF SANGER
ACADEMY CORRIDOR - ANNEXATION

EXISTING LANE GEOMETRICS & CONTROL

Project No. 11152150
Report No. -
Date: 3/28/2019

FIGURE NO. 6

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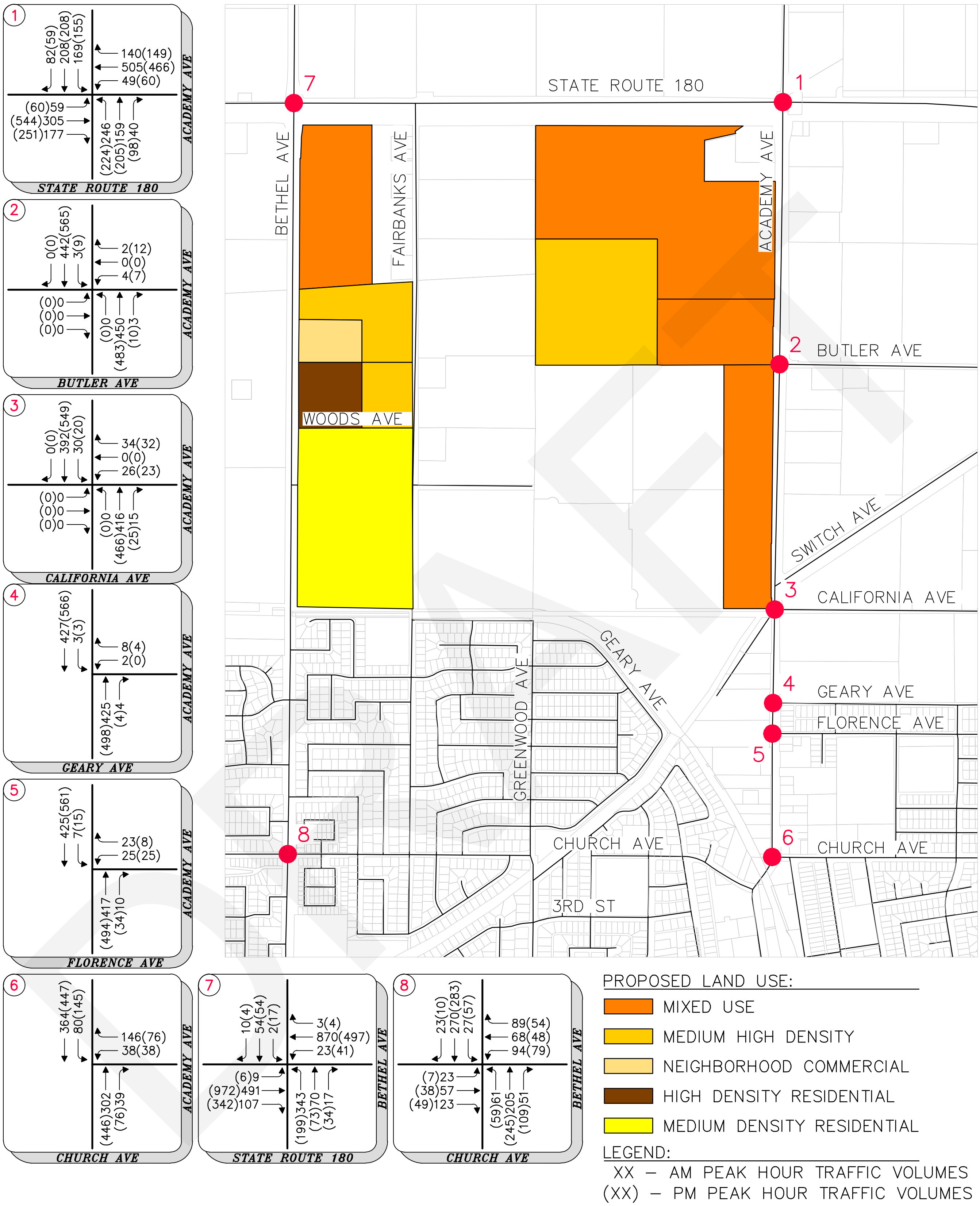

NORTH

1,500 0 1,500

1 inch =1,500 ft.

CITY OF SANGER
ACADEMY CORRIDOR - ANNEXATION

EXISTING PEAK HOUR VOLUMES

Project No. 11152150
Report No. -
Date: 3/28/2019

FIGURE NO. 7

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Existing Roadway Segment Operations

Existing highway and roadway segments were quantified using existing ADT values posted from the Caltrans website and the daily traffic counts collected in January 2018. Table 4 contains a summary of the roadway segments LOS results under *Existing* conditions.

TABLE 4
EXISTING: ROADWAY SEGMENTS LEVEL OF SERVICE

Roadway Segment	Limits	No. of Lanes	Facility Type	AADT	LOS
State Route 180	Bethel Avenue – Academy Avenue	4	Divided Expressway	18,600	A
State Route 180	Academy Avenue – Newmark Avenue	4	Divided Expressway	15,300	A
Academy Avenue	Church Avenue – Butler Avenue	4	Principal Arterial	12,520	A
Academy Avenue	Butler Avenue – State Route 180	4	Principal Arterial	13,000	A
Bethel Avenue	Church Avenue – Florence Avenue	4	Arterial	7,290	A
Bethel Avenue	Florence Avenue – State Route 180	2	Collector	8,260	C

As shown in Table 4, all of the study roadway segments are currently operating at acceptable conditions under *Existing* conditions.

Existing plus Project

Project Description

As identified in the introduction, the City of Sanger proposes to annex approximately 300 acres on both sides of North Academy and North Bethel Avenues between the current City of Sanger City limits boundary (along California Avenue alignment) north to State Route 180 (Kings Canyon Road). This annexation would extend its boundary northward to include the addition of approximately 7 acres of Neighborhood Commercial, 163 acres of Mixed-Use, 65 acres of Medium High Density Residential, 54 acres of Medium Density Residential, an 11 acres of High Density Residential uses. Additional acreage will be included used for storm drain facilities to accommodate planned growth.

Figure 8 presents the proposed project, including a breakdown of residential, mixed-use and commercial types of land uses. In addition, Figure 8 identifies the proposed street system within the plan area. Note that the traffic signal and planned roads identified in the legend are based upon the Draft GPU.

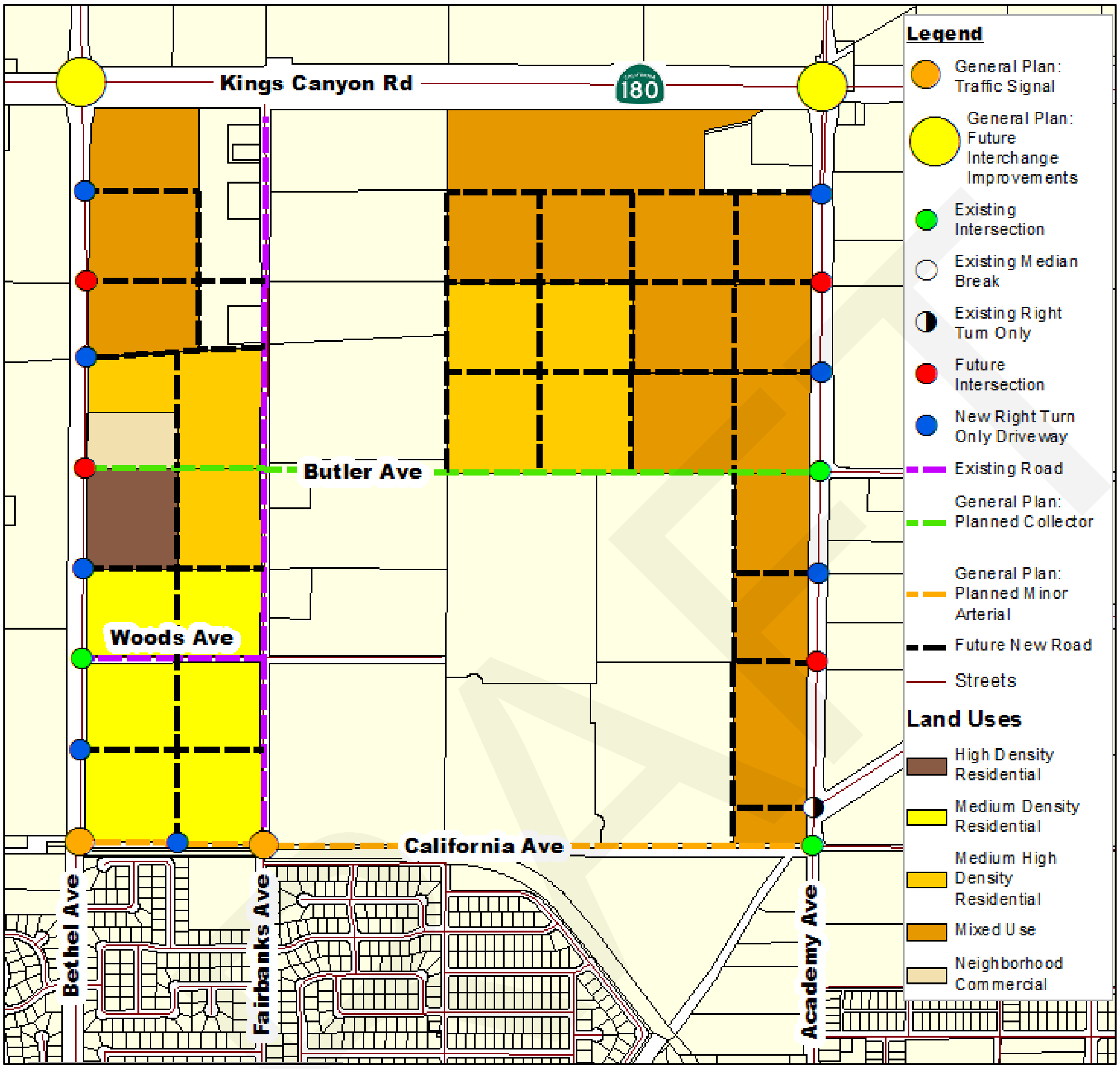


FIGURE 8: PROPOSED LAND USE/STREET NETWORK

Trip Generation

The analysis assumes that the North Academy Avenue corridor will provide an additional 300 acres of mixed-use development (commercial and residential), medium and high residential development and neighborhood commercial land uses (shown in Figure 8). However, for trip generation purposes, it is proposed that approximately one-third of the non-residential land and one-half of the residential uses will be developed between now and 2035. Following determination of proposed development in raw acres, several assumptions were made to convert values into square feet in order to calculate trip generation. These assumptions include using a floor area ratio (FAR) of 0.2, which includes a 5.8% reduction for roads. Table 5 identifies proposed project trip generation for the North Academy Avenue Corridor project.

TABLE 5
PROJECT TRIP GENERATION

Land Use Category (ITE Code)		Unit	Rate/Unit	AM Peak Hour Trip Rate/Unit			PM Peak Hour Trip Rate/Unit		
				Total	In %	Out %	Total	In %	Out %
Multifamily Housing (Low-Rise) (220)		D.U.	7.32	0.46	0.23	0.77	0.56	0.63	0.37
Shopping Center (820)		GLA	37.75	0.94	0.62	0.38	3.81	0.48	0.52
Corridor Path		**D.U. or KSF**	**Daily Trips**	**AM Peak Hour Trip**			**PM Peak Hour Trip**		
				Total	**In**	**Out**	**Total**	**In**	**Out**
Academy Ave									
Mixed Use 1 (R)	*D.U.*	81	593	37	9	29	45	29	17
Mixed Use 2 (R)	*D.U.*	20	146	9	2	7	11	7	4
Mixed Use 3 (R)	*D.U.*	31	227	14	3	11	17	11	6
Mixed Use 1 (C)	*Sq.Ft*	140	5,275	131	81	50	532	256	277
Mixed Use 2 (C)	*Sq.Ft*	34	2,019	32	20	12	131	63	68
Mixed Use 3 (C)	*Sq.Ft*	53	2,019	50	31	19	204	98	106
Medium High Density Residential	*D.U.*	296	2,167	136	31	105	166	104	61
	Subtotal	**656**	**12,445**	**411**	**178**	**233**	**1,107**	**567**	**540**
Bethel Ave									
Mixed Use 4 (R)	*D.U.*	31	227	14	3	11	17	11	6
Mixed Use 4 (C)	*Sq.Ft*	46	1,736	43	27	16	175	84	91
Neighborhood Commercial	*Sq.Ft*	20	760	19	12	7	77	37	40
Medium High Density Residential 1	*D.U.*	118	867	54	13	42	66	42	25
Medium High Density Residential 2	*D.U.*	67	488	31	7	24	37	23	14
Medium Density Residential	*D.U.*	319	2,332	147	34	113	178	112	66
High Density Residential	*D.U.*	110	805	51	12	39	62	39	23
	Subtotal	**711**	**7,215**	**359**	**107**	**252**	**613**	**348**	**265**
	Total	**1,366**	**19,659**	**770**	**285**	**485**	**1,720**	**916**	**804**

As shown in Table 5, the project is expected to generate approximately 19,659 daily trips, including 770 AM peak hour trips, and 1,720 PM peak hour trips.

Trip Distribution

The project trip distribution was developed using the Fresno COG Regional Travel Demand Forecast Model, supplemented by the daily and peak hour traffic counts collected, adjacent land uses and geographical location of the site. A majority of the trips gravitate toward State Route 180 (Kings Canyon Road) and the Bethel and Academy Avenue corridors.

Project Access & Trip Assignment

Beyond trip distribution, trip assignment determines which driveways, and in turn which surface streets (Academy Avenue, Butler Avenue, etc.) users will utilize to get to and from their destinations. Logical travel paths are based upon location of land use, geometrics of intersections/driveways and trip distribution.

Existing plus Project Intersection Operations

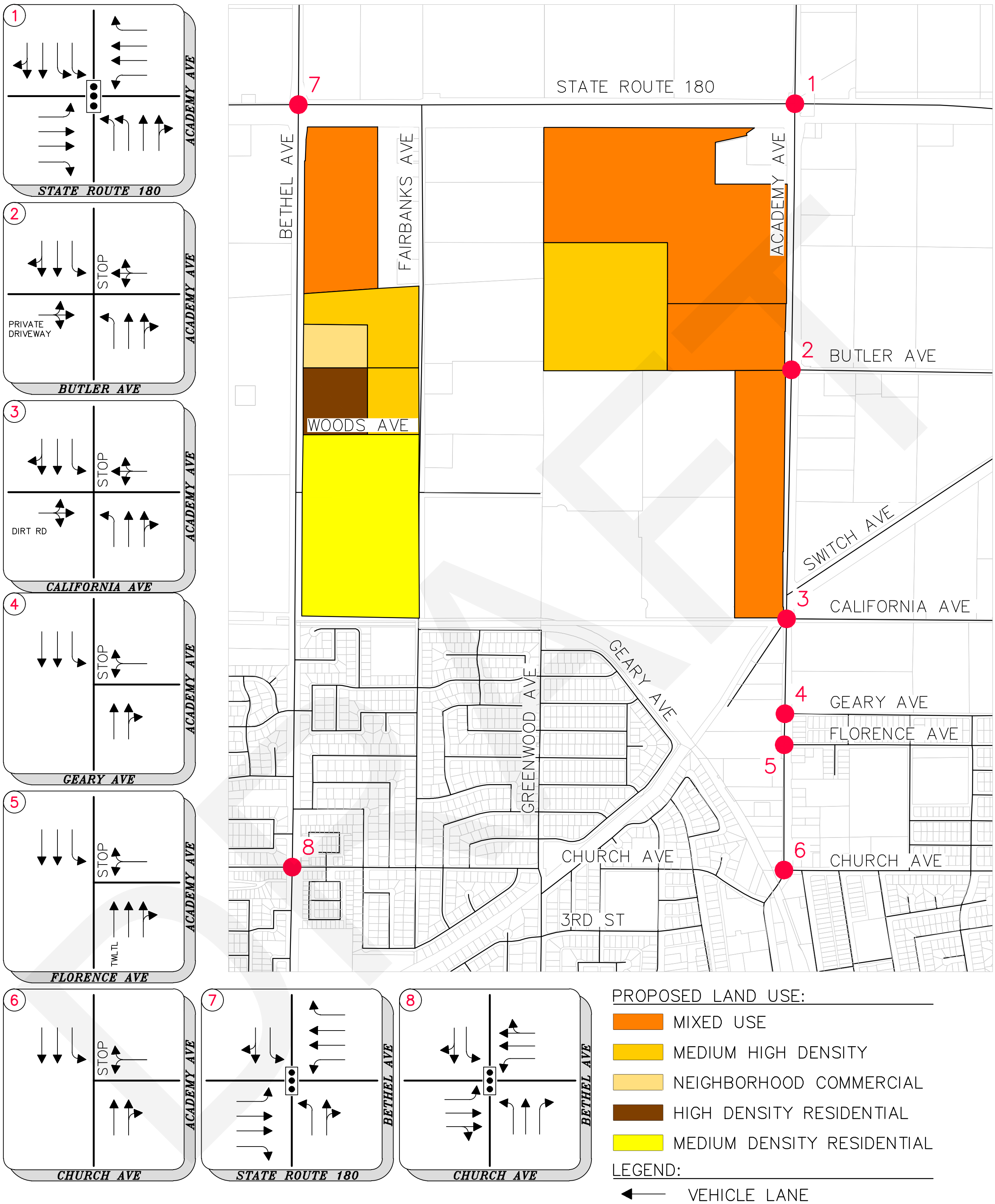
Existing plus Project conditions analyze the proposed growth of the planned circulation network of the City of Sanger. Existing road geometric characteristics were used to analyze the *Existing plus Project* scenario. *Existing plus Project* lane geometrics are presented in Figure 9. Intersection traffic volumes were developed by superimposing proposed project volumes to *Existing* conditions. The resulting *Existing plus Project* traffic volumes are presented in Figure 10. Table 6 presents the projected LOS for the *Existing plus Project* conditions.

TABLE 6
EXISTING PLUS PROJECT: INTERSECTION LEVEL OF SERVICE

#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay[4]	LOS	Warrant Met?[3]	Delay	LOS	Warrant Met?[3]
1	Academy Ave/Kings Canyon Rd (SR 180)	Signal	C	10.7	B	--	13.0	B	--
2	**Academy Ave/Butler Ave**	**TWSC**	**C**	17.6	C	No	**156.1**	**F**	**Yes**
3	**Academy Ave/California Ave**	**TWSC**	**C**	15.5	C	No	**27.9**	**D**	**No**
4	Academy Ave/Geary Ave	TWSC	C	10.6	B	No	11.0	B	No
5	Academy Ave/Florence Ave	TWSC	C	12.3	B	No	16.6	C	No
6	**Academy Ave/Church Ave**	**TWSC**	**C**	14.0	B	No	**34.2**	**D**	**Yes**
7	Bethel Ave/Kings Canyon Rd (SR 180)	Signal	C	15.1	B	--	18.4	B	--
8	Bethel Ave/Church Ave	Signal	C	10.8	B	No	5.8	A	--

Notes:
1. TWSC = Two Way Stop Control
2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for Signal
3. Warrant = Based on California MUTCD Warrant 3
4. OVR = Delay exceeds 300 seconds

As shown in bold type in Table 6, three (3) PM peak hour intersection deficiencies are projected to operate at unacceptable LOS D or worse conditions under *Existing plus Project* conditions. Further, two (2) intersection meets the CA MUTCD Warrant 3 (Academy Ave/Butler Ave). The remaining deficient projected intersections do not meet the CA MUTCD Warrant 3. All Mitigation measures are discussed in a subsequent section of this report.



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1 inch =1,500 ft.

CITY OF SANGER
ACADEMY CORRIDOR - ANNEXATION

EXISTING plus PROJECT LANE GEOMETRICS & CONTROL

Project No. 11152150
Report No. -
Date: 3/28/2019

FIGURE NO. 9

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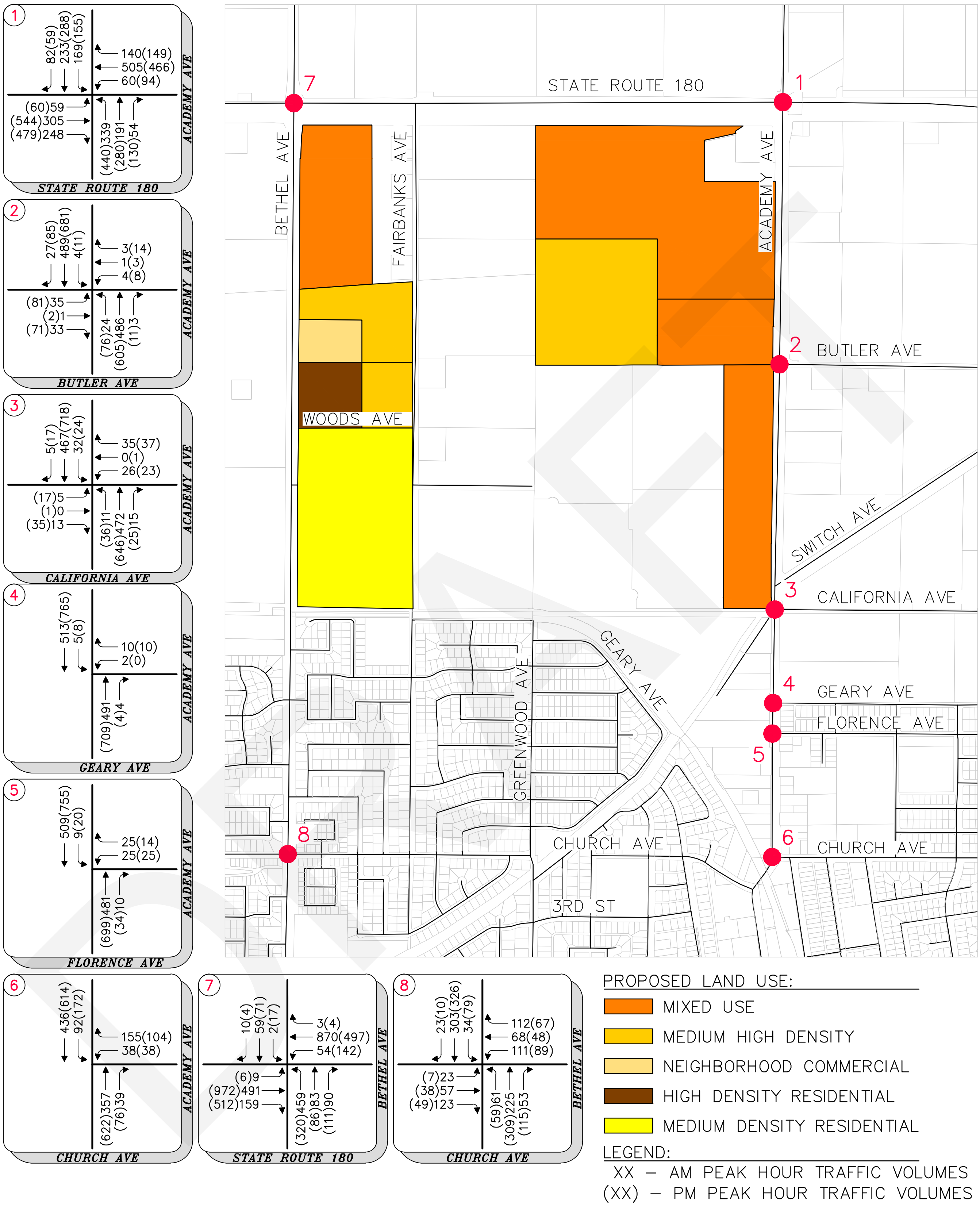

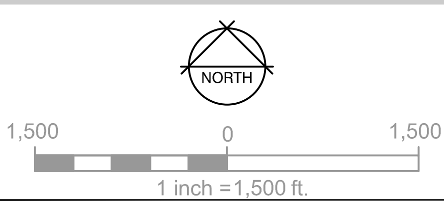

CITY OF SANGER
ACADEMY CORRIDOR - ANNEXATION

EXISTING plus PROJECT CONDITIONS
PEAK HOUR VOLUMES

Project No. 11152150
Report No. -
Date: 3/28/2019

FIGURE NO. 10

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Existing plus Project Roadway Segment Operations

Existing plus Project roadway segments for daily trips were quantified by superimposing proposed project volumes to the *Existing Conditions* ADT values. Table 7 contains a summary of the *Existing plus Project* conditions roadway segments LOS results.

TABLE 7
EXISTING PLUS PROJECT: ROADWAY SEGMENTS LEVEL OF SERVICE

Roadway Segment	Limits	No. of Lanes	Facility Type	AADT	LOS
State Route 180	Bethel Avenue – Academy Avenue	4	Divided Expressway	20,580	A
State Route 180	Academy Avenue – Newmark Avenue	4	Divided Expressway	16,030	A
Academy Avenue	Church Avenue – Butler Avenue	4	Principal Arterial	16,820	A
Academy Avenue	Butler Avenue – State Route 180	4	Principal Arterial	20,390	A
Bethel Avenue	Church Avenue – Florence Avenue	4	Arterial	8,320	A
Bethel Avenue	**Florence Avenue – State Route 180**	**2**	**Collector**	**13,810**	**F**

As presented in Table 7, all of the study roadway segments, with the exception of one (1) segment, is expected to operate at acceptable LOS under *Existing plus Project* conditions. The roadway segment of Bethel Avenue between Florence Avenue and State Route 180 is expected to operate at LOS F conditions. All mitigation measures are discussed in a subsequent section on this report.

Cumulative Conditions

Cumulative conditions refer to general buildout of the City of Sanger General Plan. The Fresno Council of Governments (Fresno COG) Regional Travel Demand Forecast Model for 2015 and 2035 conditions were utilized to develop a growth rate for a 20 year period (2015 to 2035). The annual growth rate per study intersection and road was then applied over a 20 year period and added to the existing turning movement counts to develop Cumulative conditions.

In addition, the future roadway network includes new roads, i.e., extension of Butler and California Avenues between Indianola Avenue and Academy Avenue. These roads are shown in the General Plan and will provide improved east-west circulation in northern Sanger.

Cumulative No Project Traffic Operations

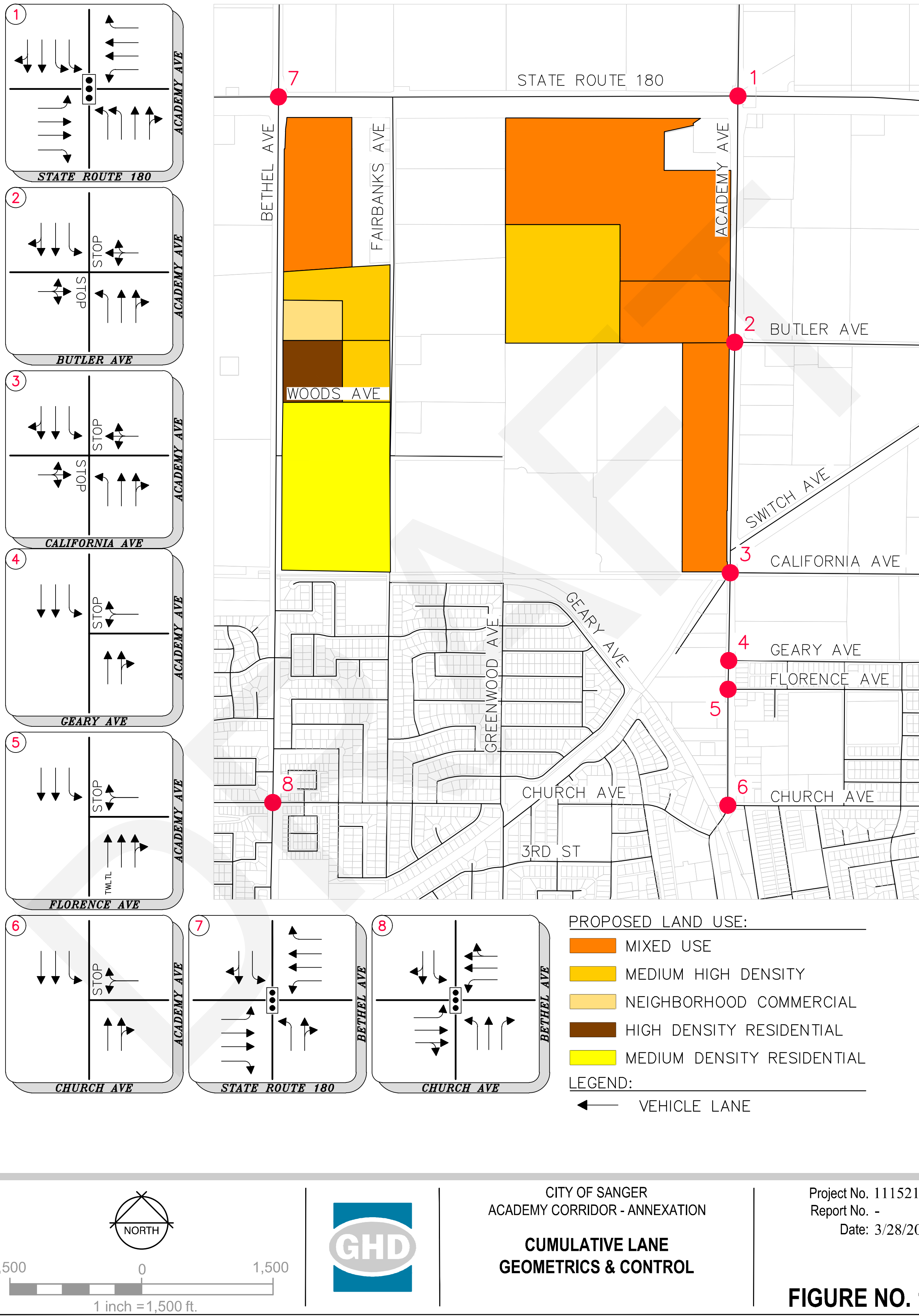
For *Cumulative No Project* conditions, lane geometrics and control are presented in Figure 11 and peak hour turning movement volumes are shown in Figure 12. Table 8 contains summaries of the resulting *Cumulative No Project* intersection LOS conditions.

TABLE 8
CUMULATIVE NO PROJECT CONDITIONS: INTERSECTION LEVEL OF SERVICE

#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay[4]	LOS	Warrant Met?[3]	Delay[4]	LOS	Warrant Met?[3]
1	Academy Ave/Kings Canyon Rd (SR 180)	Signal	C	13.3	B	--	14.2	B	--
2	**Academy Ave/Butler Ave**	**TWSC**	**C**	**42.0**	**E**	**No**	**205.7**	**F**	**No**
3	**Academy Ave/California Ave**	**TWSC**	**C**	**OVR**	**F**	**Yes**	**OVR**	**F**	**Yes**
4	Academy Ave/Geary Ave	TWSC	C	11.4	B	No	15.7	C	No
5	Academy Ave/Florence Ave	TWSC	C	13.7	B	No	22.7	C	No
6	**Academy Ave/Church Ave**	**TWSC**	**C**	**43.1**	**E**	**Yes**	**OVR**	**F**	**Yes**
7	Bethel Ave/Kings Canyon Rd (SR 180)	Signal	C	25.7	C	--	21.2	C	--
8	Bethel Ave/Church Ave	Signal	C	10.0	A	--	5.1	A	--

Notes:
1. TWSC = Two Way Stop Control
2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for Signal
3. Warrant = Based on California MUTCD Warrant 3
4. OVR = Delay exceeds 300 seconds

As presented in bold type on Table 8, three (3) AM and three (3) PM intersection deficiencies are projected to operate at unacceptable LOS E or worse conditions under *Cumulative No Project* conditions. Additionally, the intersections of Academy Avenue/California Avenue and Academy Avenue/Church Avenue – both AM/PM peak hours – are anticipated to meet the CA MUTCD Warrant 3. All Mitigation measures are discussed in a subsequent section of this report.



CITY OF SANGER
ACADEMY CORRIDOR - ANNEXATION

CUMULATIVE LANE GEOMETRICS & CONTROL

Project No. 11152150
Report No. -
Date: 3/28/2019

FIGURE NO. 11

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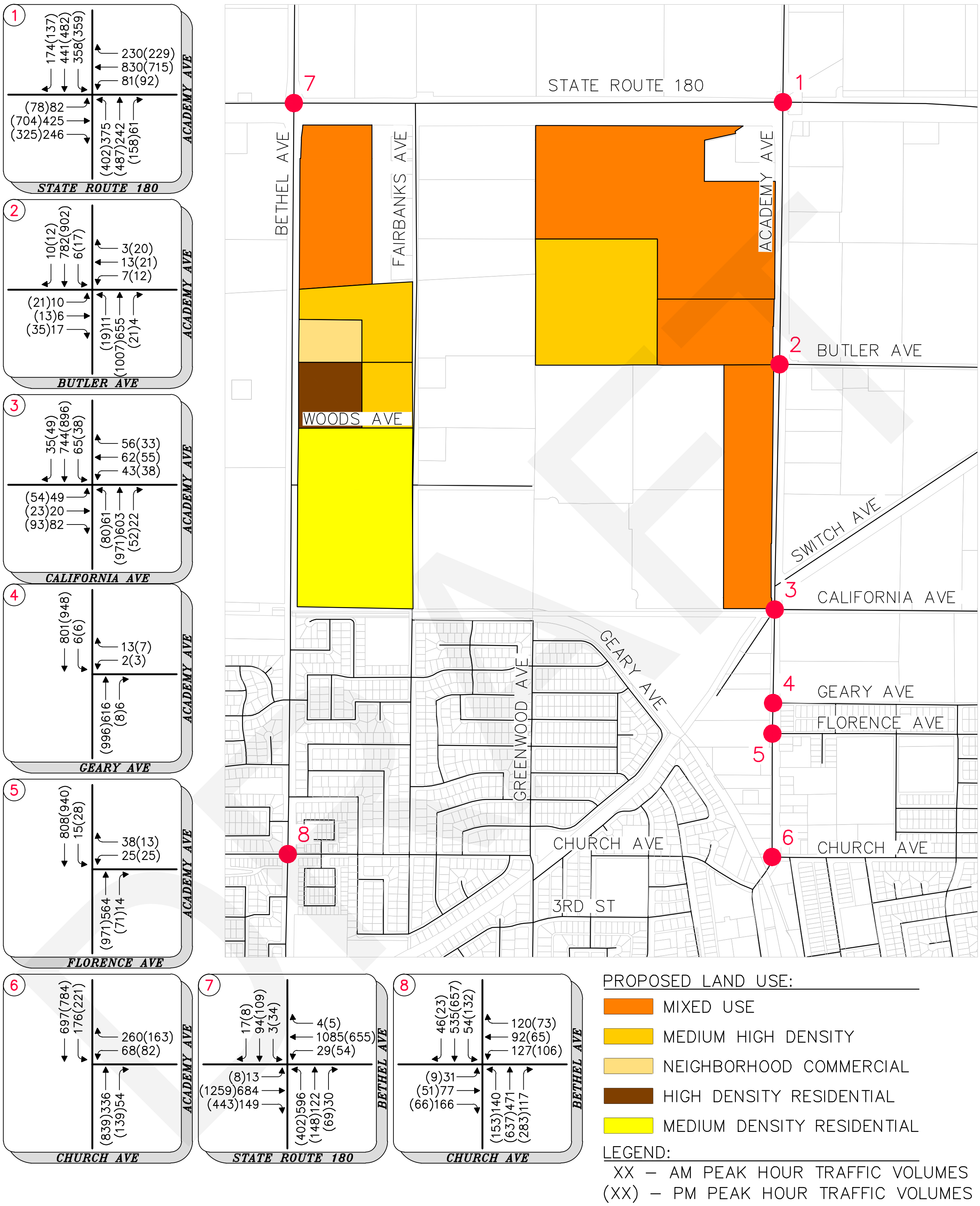

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1 inch =1,500 ft.

CITY OF SANGER
ACADEMY CORRIDOR - ANNEXATION

CUMULATIVE NO-PROJECT PEAK HOUR VOLUMES

Project No. 11152150
Report No. -
Date: 3/28/2019

FIGURE NO. 12

Filename: L:\Prj\2449\T2449\T2449TG001.dwg

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Cumulative No Project Roadway Segment Operations

Cumulative No Project roadway segment operations daily were quantified using the Fresno COG Regional Travel Demand Forecast Model and growth rates. Table 9 contains a summary of the *Cumulative No Project* conditions roadway segments LOS results.

TABLE 9
CUMULATIVE NO PROJECT: ROADWAY SEGMENTS LEVEL OF SERVICE

Roadway Segment	Limits	No. of Lanes	Facility Type	AADT	LOS
State Route 180	**Bethel Avenue – Academy Avenue**	**4**	**Divided Expressway**	**39,770**	**E**
State Route 180	Academy Avenue – Newmark Avenue	4	Divided Expressway	28,160	C
Academy Avenue	Church Avenue – Butler Avenue	4	Principal Arterial	22,200	B
Academy Avenue	Butler Avenue – State Route 180	4	Principal Arterial	21,890	A
Bethel Avenue	Church Avenue – Florence Avenue	4	Principal Arterial	10,160	A
Bethel Avenue	Florence Avenue – State Route 180	4	Principal Arterial	14,020	A

As presented in bold type in Table 9, all of the study roadway segments currently or are expected to operate at acceptable LOS in the *Cumulative No Project* conditions with the exception of a roadway segment along State Route 180 between Bethel and Academy Avenues. This segment is forecasted to operate at LOS E conditions. Mitigation measures are discussed in a subsequent section on this report.

Cumulative plus Project

Cumulative plus Project Intersection Operations

Cumulative plus Project conditions were developed by adding proposed project volumes to *Cumulative No Project* intersection traffic volumes. Intersection geometrics assumed are the same as *Cumulative "No Project".* Figure 13 identifies *Cumulative plus Project* lane geometrics and control and Figure 14 shows the resulting *Cumulative plus Project* AM and PM peak hour intersection traffic volumes. Table 10 presents the results of the *Cumulative plus Project* condition analysis.

TABLE 10
CUMULATIVE PLUS PROJECT CONDITIONS: INTERSECTION LEVEL OF SERVICE

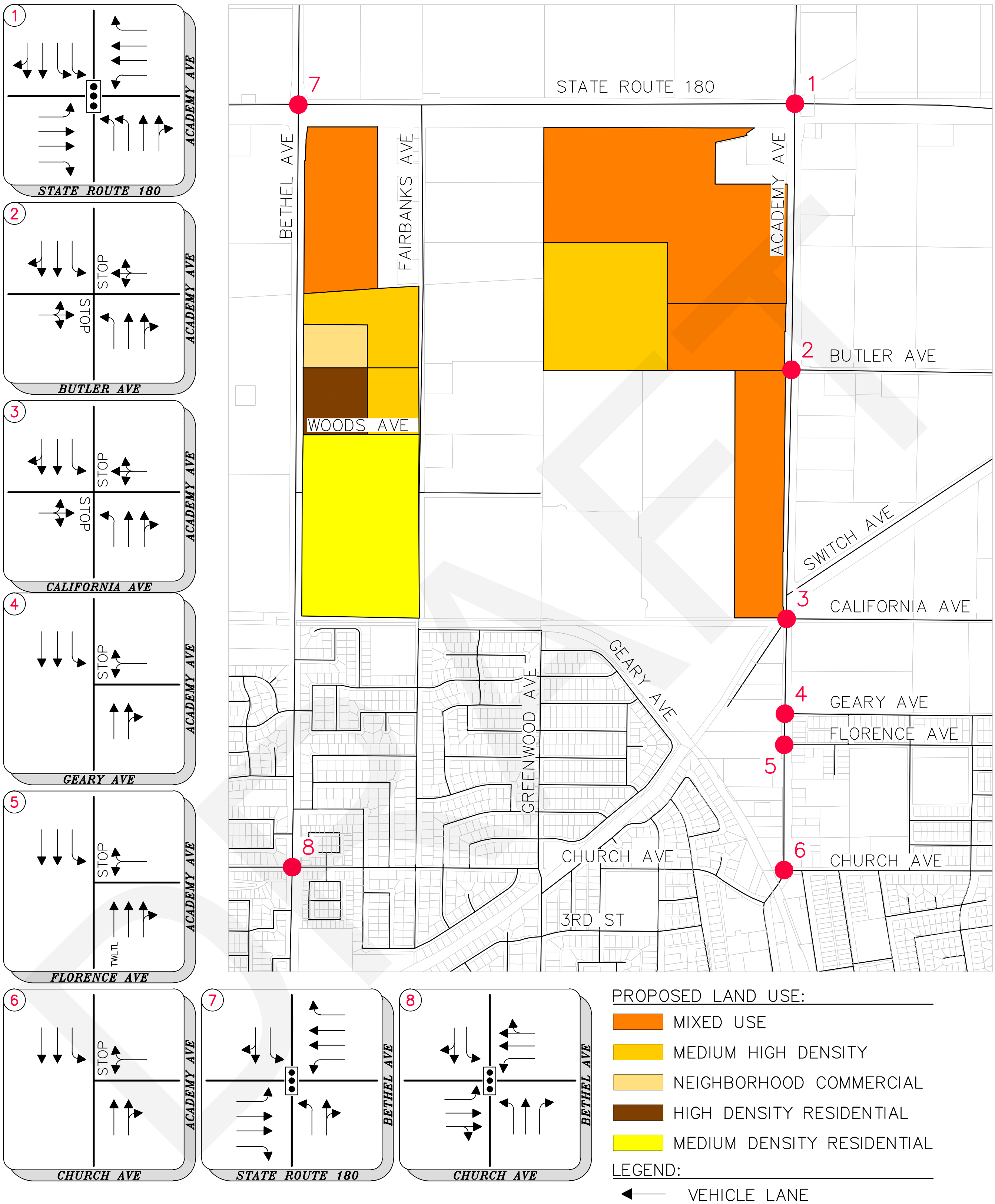
#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour Delay[4]	AM Peak Hour LOS	AM Peak Hour Warrant Met?[3]	PM Peak Hour Delay[4]	PM Peak Hour LOS	PM Peak Hour Warrant Met?[3]
1	Academy Ave/Kings Canyon Rd (SR 180)	Signal	C	14.4	B	--	24.1	C	--
2	**Academy Ave/Butler Ave**	**TWSC**	**C**	**95.2**	**F**	**No**	**OVR**	**F**	**Yes**
3	**Academy Ave/California Ave**	**TWSC**	**C**	**OVR**	**F**	**Yes**	**OVR**	**F**	**Yes**
4	Academy Ave/Geary Ave	TWSC	C	11.8	B	No	17.3	C	No
5	Academy Ave/Florence Ave	TWSC	C	14.6	B	No	**28.7**	**D**	**No**
6	**Academy Ave/Church Ave**	**TWSC**	**C**	**73.8**	**F**	**Yes**	**OVR**	**F**	**Yes**
7	**Bethel Ave/Kings Canyon Rd (SR 180)**	**Signal**	**C**	**45.5**	**D**	--	34.5	C	--
8	Bethel Ave/Church Ave	Signal	C	12.6	B	--	5.3	A	--

Notes:
1. TWSC = Two Way Stop Control
2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for Signal
3. Warrant = Based on California MUTCD Warrant 3
4. OVR = Delay exceeds 300 seconds

As presented in bold type in Table 10, four (4) AM and four (4) PM peak hour intersection deficiencies are projected to operate at unacceptable LOS D conditions under *Cumulative plus Project* conditions. Further, three (3) intersections along Academy Avenue (California, Butler and Church Avenues) are anticipated to meet the CA MUTCD Warrant 3 (Peak Hour) under AM and/or PM peak periods. All Mitigation measures are discussed in a subsequent section of this report.

Cumulative plus Project Roadway Segment Operations

Cumulative plus Project freeway segments and ramp segments for AM and PM peak hours were quantified by superimposing proposed project traffic over the *Cumulative No Project* traffic volumes. Table 11 shows *Cumulative plus Project* conditions roadway segments LOS results.



NORTH

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1 inch =1,500 ft.

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CITY OF SANGER
ACADEMY CORRIDOR - ANNEXATION

CUMULATIVE plus PROJECT LANE GEOMETRICS & CONTROL

Project No. 11152150
Report No. -
Date: 3/28/2019

FIGURE NO. 13

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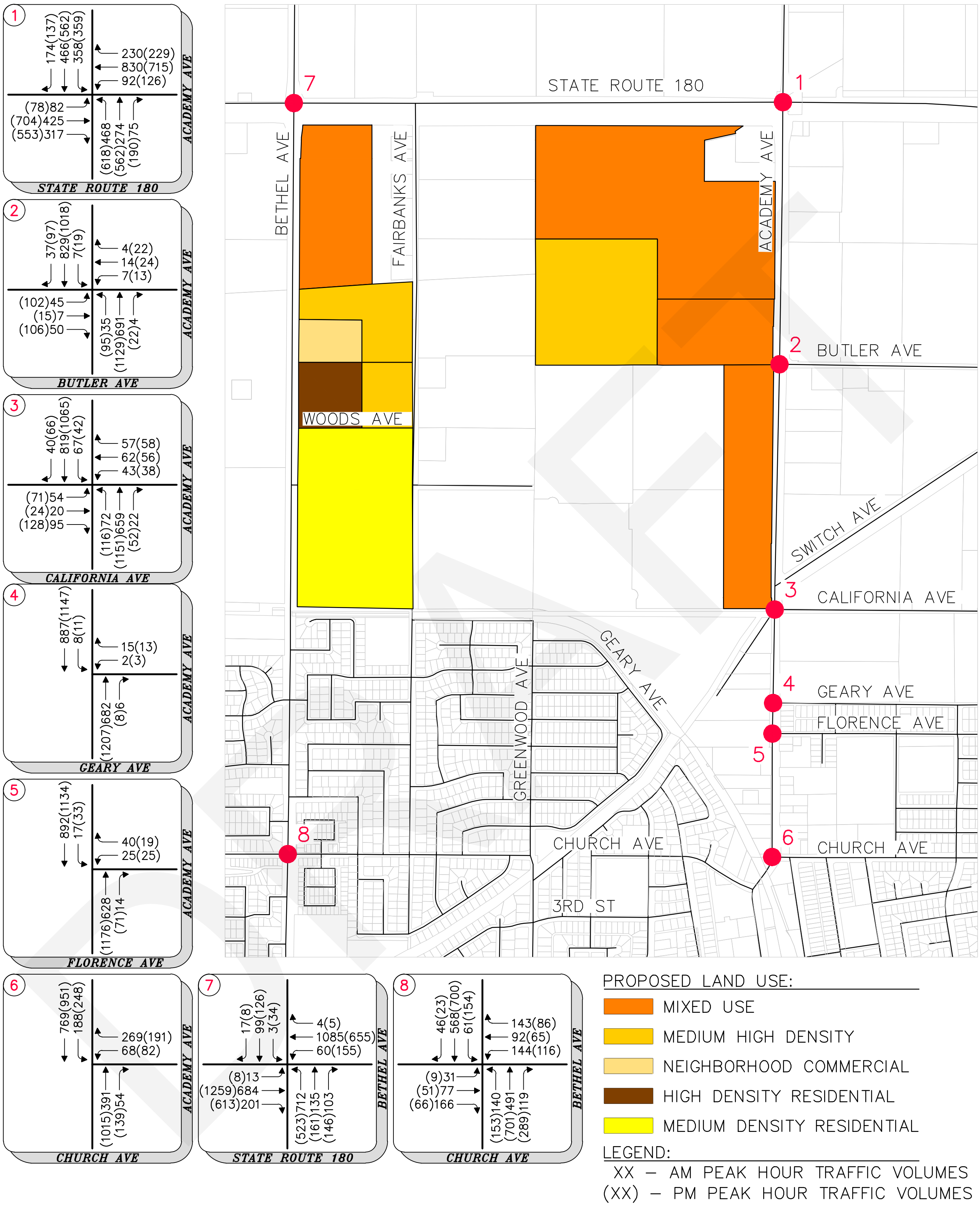

NORTH

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1 inch =1,500 ft.

CITY OF SANGER
ACADEMY CORRIDOR - ANNEXATION

CUMULATIVE plus PROJECT PEAK HOUR VOLUMES

Project No. 11152150
Report No. -
Date: 3/28/2019

FIGURE NO. 14

Filename: L:\Prj\2449\T2449\T2449TG001.dwg

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TABLE 11
CUMULATIVE PLUS PROJECT: ROADWAY SEGMENTS LEVEL OF SERVICE

Roadway Segment	Limits	No. of Lanes	Facility Type	AADT	LOS
State Route 180	**Bethel Avenue – Academy Avenue**	**4**	**Divided Expressway**	**41,750**	**F**
State Route 180	Academy Avenue – Newmark Avenue	4	Divided Expressway	28,890	C
Academy Avenue	Church Avenue – Butler Avenue	4	Principal Arterial	26,500	C
Academy Avenue	**Butler Avenue – State Route 180**	**4**	**Principal Arterial**	**29,280**	**D**
Bethel Avenue	Church Avenue – Florence Avenue	4	Principal Arterial	11,190	A
Bethel Avenue	Florence Avenue – State Route 180	4	Principal Arterial	19,560	A

As presented in bold type in Table 11, two (2) of the study roadway segments are projected to operate at unacceptable LOS D or worse conditions in the *Cumulative plus Project* conditions scenario. Mitigation measures are discussed in the following section of this report.

Recommended Mitigation Measures

This section presents project impacts at the study intersections based upon the results of the analysis presented in this report. Mitigation measures have been developed for worst case scenarios to achieve acceptable LOS conditions. Although traffic signals have been recommended, other intersection improvements, such as roundabouts, should be considered.

However, mitigation measures identified in this section did not include operational analysis of roundabouts due to additional analysis that would be required. Should roundabouts be considered on any state facilities, it is recommended that an Intersection Control Evaluation (ICE), per Caltrans standards, be assessed to determine if it is a feasible mitigation measure for this corridor. Figure 15, at the end of this sections, identifies Mitigated Lane Geometrics and Control under *Cumulative plus Project* conditions.

Existing Deficiencies & Mitigations

Under *Existing* conditions, all of the study intersections operate at unacceptable LOS “C” or better conditions. Therefore, mitigation measures are not recommended under this scenario.

Existing plus Project Deficiencies & Mitigations

Under *Existing plus Project* conditions, three (3) intersections are projected to operate at unacceptable LOS D or worse conditions. As such the following mitigation measures are recommended.

Academy Avenue/Butler Avenue (#2): Install traffic signal. This intersection is forecasted to operate at LOS F conditions during the PM peak hour and is anticipated to meet the CA MUTCD Warrant 3 (Peak Hour). With installation of a traffic signal and extension of Butler Avenue as a two-lane roadway, this intersection is forecasted to operate at LOS A with 6.0 seconds of delay.

#	Intersection	Control Type	Delay	LOS
2	Academy Ave/Butler Ave	Signal	6.0	A

Academy Avenue/California Avenue (#3): Install AWSC. This intersection is projected to operate at LOS D conditions during the PM peak hour and is not anticipated to meet the CA MUTCD Warrant 3 (Peak Hour). With installation of an All-Way-Stop Control and extension of California Avenue as a two-lane roadway, this intersection is forecasted to operate at LOS C with 24.6 seconds of delay.

#	Intersection	Control Type	Delay	LOS
3	Academy Ave/California Ave	AWSC	24.6	C

Academy Avenue/Church Avenue (#6): Install a traffic signal. This intersection is anticipated to operate at LOS D conditions during the PM peak hour and is anticipated to meet the CA MUTCD Warrant 3 (Peak Hour). With installation of a traffic, this intersection is forecasted to operate at LOS A with 5.1 seconds of delay.

#	Intersection	Control Type	Delay	LOS
6	Academy Ave/Church Ave	Signal	5.1	A

Roadway Segments

Bethel Avenue between Florence Avenue and State Route 180: Widen to a four-lane facility. This roadway segment is projected to operate at LOS F conditions under this scenario. Widening the roadway from a two-lane collector to a four-lane principal arterial is expected to result in LOS A conditions. It should be noted that this improvement is consistent with the Draft 2019 General Plan.

Cumulative No Project Deficiencies & Mitigations

Under *Cumulative No Project* conditions three (3) AM and three (3) PM intersection deficiencies are projected to operate at unacceptable LOS E or worse conditions under *Cumulative No Project* conditions. Further, the intersections of Academy Avenue/California Avenue and Academy Avenue/Church Avenue – both AM/PM peak hours – are anticipated to meet the CA MUTCD Warrant 3.

Academy Avenue/Butler Avenue (#2): Install traffic signal. This intersection is projected to operate at LOS F conditions during the PM peak hour and is not anticipated to meet the CA MUTCD Warrant 3 (Peak Hour). With installation of a traffic signal and extension of Butler Avenue as a two-lane roadway, this intersection is forecasted to operate at LOS A with 4.5 seconds of delay.

#	Intersection	Control Type	Delay	LOS
2	Academy Ave/Butler Ave	Signal	4.5	A

Academy Avenue/California Avenue (#3): Install traffic signal. This intersection is forecasted to operate at LOS F conditions during the PM peak hour and is anticipated to meet the CA MUTCD Warrant 3 (Peak Hour). With installation of a traffic signal and extension of California Avenue as a two-lane roadway, this intersection is projected to operate at LOS A with 13.5 seconds of delay.

#	Intersection	Control Type	Delay	LOS
3	Academy Ave/California Ave	Signal	13.5	B

Academy Avenue/Church Avenue (#6): Install traffic signal. This intersection is expected to operate at LOS F conditions during the PM peak hour and is anticipated to meet the CA MUTCD Warrant 3 (Peak Hour). With installation of a traffic signal, this intersection is anticipated to operate at LOS A with 9.5 seconds of delay.

#	Intersection	Control Type	Delay	LOS
6	Academy Ave/Church Ave	Signal	9.5	A

Cumulative plus Project Deficiencies & Mitigations

Under *Cumulative plus Project* conditions, three (3) AM and four (4) PM peak hour intersection deficiencies are projected to operate at unacceptable LOS D conditions under *Cumulative plus Project* conditions. Further, three intersections along Academy Avenue (California, Butler and Church Avenues) are anticipated to meet the CA MUTCD Warrant 3 (Peak Hour) under AM and/or PM peak periods.

Academy Avenue/Butler Avenue (#2): Install traffic signal. This intersection is forecasted to operate at LOS F conditions during the PM peak hour and is anticipated to meet the CA MUTCD Warrant 3 (Peak Hour). With installation of a traffic signal and extension of Butler Avenue as a two-lane roadway, this intersection is projected to operate at LOS A with 7.7 seconds of delay.

#	Intersection	Control Type	Delay	LOS
2	Academy Ave/Butler Ave	Signal	7.7	A

Academy Avenue/California Avenue (#3): Install traffic signal. This intersection is projected to operate at LOS F conditions during the PM peak hour and not anticipated to meet the CA MUTCD Warrant 3 (Peak Hour). With installation of a traffic signal and extension of California Avenue as a two-lane roadway, this intersection is forecasted to operate at LOS A with 18.7 seconds of delay.

#	Intersection	Control Type	Delay	LOS
3	Academy Ave/California Ave	Signal	18.7	B

Academy Avenue/Florence Avenue (#5): Monitor future traffic operations. This intersection is expected to operate at LOS D conditions during the PM peak hour; however, it is not anticipated to meet the CA MUTCD Warrant 3 (Peak Hour). Potential mitigation measures might include converting this intersection to a right-turn-only (RTO) intersection to eliminate critical westbound left turning movements. These WBL trips could be routed north to Geary Avenue to conduct U-turns or to the south at future traffic signal at Church Avenue/Academy Avenue. It is recommended that the City of Sanger monitor future PM peak hour intersection operations (i.e., peak hour turning movement counts or complete warrant analysis) at this intersection to determine if LOS has been degraded below the LOS C standard.

Academy Avenue/Church Avenue (#6): Install traffic signal. This intersection is forecasted to operate at LOS F conditions during the PM peak hour and is anticipated to meet the CA MUTCD Warrant 3 (Peak Hour). With installation of a traffic signal, this intersection is projected to operate at LOS A with 15.3 seconds of delay.

#	Intersection	Control Type	Delay	LOS
6	Academy Ave/Church Ave	Signal	15.3	B

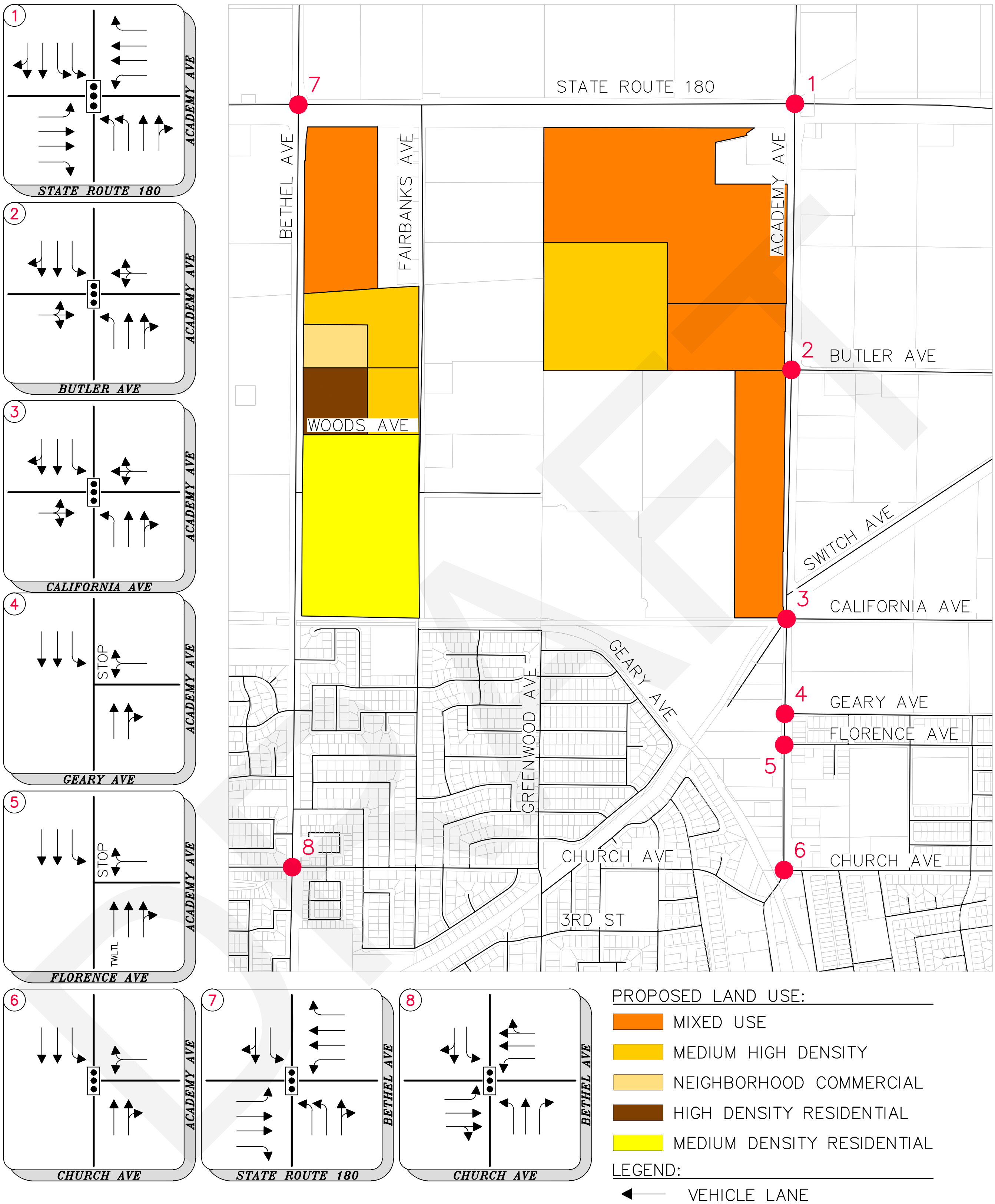
Bethel Avenue/ Kings Canyon Rd (SR 180) (#7): Install additional northbound left turn lane. This intersection is predicted to operate at LOS D conditions during the AM peak hour. With installation of an additional northbound left turn lane, this intersection is expected to operate at LOS B with 14.8 seconds of delay.

#	Intersection	Control Type	Delay	LOS
7	Academy Ave/ Kings Canyon Rd (SR 180)	Signal	14.8	B

Roadway Segments

Academy Avenue between Butler Avenue and State Route 180: Widen to a six-lane facility. This roadway segment is projected to operate at LOS D conditions under this scenario. Widening the roadway from a four-lane principal arterial to a six-lane principal arterial is expected to result in LOS A conditions. It should be noted that this improvement is not consistent with the Draft 2019 General Plan, which is a four-lane principal arterial. Because the forecasted traffic falls within the LOS C/D cusp, this roadway should monitored and evaluated (traffic counts) prior to implementation of a potential six-lane facility.

State Route 180 between Bethel Avenue and Newmark Avenue: State Route 180 will continue to be planned as an expressway, as indicated in Caltrans' State Route 180 Transportation Concept Report. Potential improvements exist at Bethel Avenue and Academy Avenue. Potential concepts have identified at-grade and grade-separated access at these intersections (Bethel and Academy Avenues). It is important that Caltrans and the City of Sanger preserve right-of-way at these intersections to accommodate for future growth along the State Route 180 Corridor.



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1 inch =1,500 ft.

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CITY OF SANGER
ACADEMY CORRIDOR - ANNEXATION

CUMULATIVE plus PROJECT LANE GEOMETRICS & CONTROL - MITIGATION

Project No. 11152150
Report No. -
Date: 3/28/2019

FIGURE NO. 15

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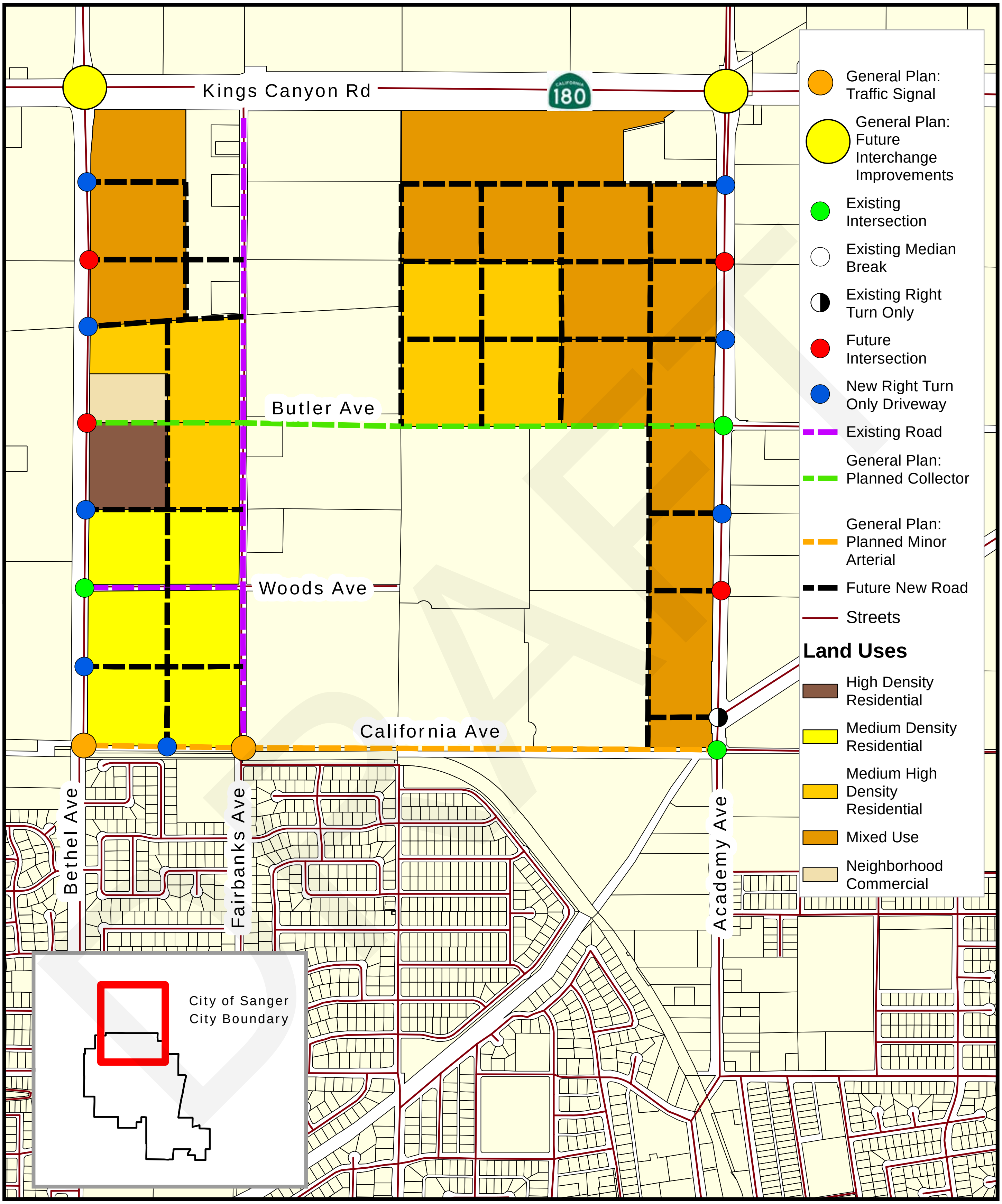
Appendices

- CITY OF SANGER: PLANNED CIRCULATION NETWORK
- METRO TRAFFIC COUNTS
- SYNCHRO ANALYSIS
- WARRANTS
- MITIGATION

CITY OF SANGER: PLANNED CIRCULATION NETWORK



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City of Sanger
Academy Corridor - Annexation
Planned Circulation Network

Project No. 11152150
Revision No. -
Date: 3/28/2019

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Print date: 01 Apr 2019 - 14:14

Data source: . Created by: jramirez2

Metro Traffic Counts

Metro Traffic Data Inc.
310 N. Irwin Street - Suite 20
Hanford, CA 93230

800-975-6938 Phone/Fax
www.metrotrafficdata.com

Turning Movement Report

Prepared For:

OMNI-Means
943 Reserve Drive
Roseville, CA 95678

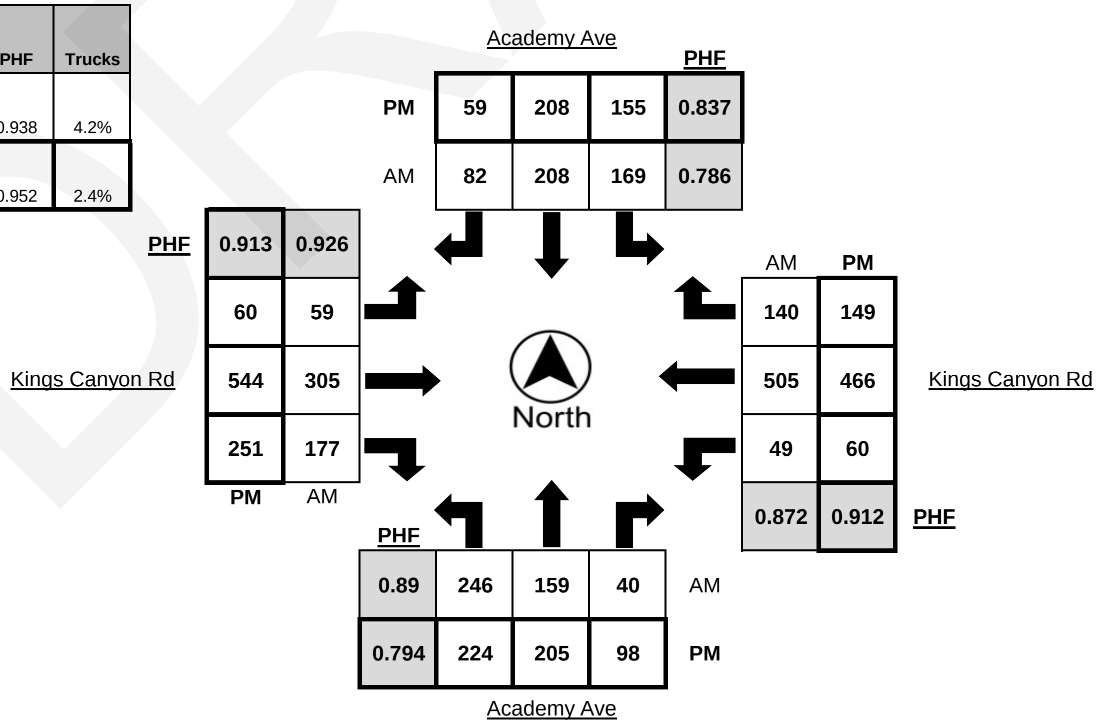
LOCATION Kings Canyon Rd @ Academy Ave
LATITUDE 36.7360
COUNTY Fresno
LONGITUDE -119.5563
COLLECTION DATE Thursday, January 11, 2018
WEATHER Clear

	Northbound				Southbound				Eastbound				Westbound			
Time	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**
7:00 AM - 7:15 AM	78	19	15	0	35	37	18	1	8	80	42	9	6	124	28	8
7:15 AM - 7:30 AM	63	30	10	4	41	57	24	3	11	88	47	8	9	157	33	10
7:30 AM - 7:45 AM	62	51	7	4	71	55	20	1	14	76	32	12	12	118	45	10
7:45 AM - 8:00 AM	57	32	8	5	29	47	15	5	18	68	56	11	16	121	36	9
8:00 AM - 8:15 AM	64	46	15	2	28	49	23	0	16	73	42	3	12	109	26	3
8:15 AM - 8:30 AM	57	24	7	3	44	58	12	7	10	79	37	13	9	110	28	6
8:30 AM - 8:45 AM	46	29	14	6	39	53	20	4	11	92	40	11	9	111	23	11
8:45 AM - 9:00 AM	49	26	13	4	26	31	16	3	7	76	51	5	7	108	19	10
TOTAL	**476**	**257**	**89**	**28**	**313**	**387**	**148**	**24**	**95**	**632**	**347**	**72**	**80**	**958**	**238**	**67**

	Northbound				Southbound				Eastbound				Westbound			
Time	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**
4:00 PM - 4:15 PM	69	54	29	1	49	42	17	1	18	111	72	2	12	119	36	5
4:15 PM - 4:30 PM	73	58	29	1	37	44	11	2	18	105	68	5	14	128	41	10
4:30 PM - 4:45 PM	49	40	29	3	50	61	15	3	13	141	55	4	8	102	37	8
4:45 PM - 5:00 PM	35	31	17	2	27	58	15	2	17	153	64	6	17	124	44	5
5:00 PM - 5:15 PM	67	76	23	2	41	45	18	1	12	145	64	4	21	112	27	2
5:15 PM - 5:30 PM	44	40	26	1	27	42	21	2	18	165	74	4	13	113	40	4
5:30 PM - 5:45 PM	35	45	19	0	38	55	13	2	15	120	70	5	14	102	29	5
5:45 PM - 6:00 PM	37	45	25	0	29	40	16	2	16	101	66	5	6	91	27	7
TOTAL	**409**	**389**	**197**	**10**	**298**	**387**	**126**	**15**	**127**	**1041**	**533**	**35**	**105**	**891**	**281**	**46**

	Northbound				Southbound				Eastbound				Westbound			
PEAK HOUR	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**
7:15 AM - 8:15 AM	246	159	40	15	169	208	82	9	59	305	177	34	49	505	140	32
4:15 PM - 5:15 PM	224	205	98	8	155	208	59	8	60	544	251	19	60	466	149	25

	PHF	**Trucks**
AM	0.938	4.2%
PM	0.952	2.4%



Metro Traffic Data Inc.
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800-975-6938 Phone/Fax
www.metrotrafficdata.com

Turning Movement Report

Prepared For:

OMNI-Means
943 Reserve Drive
Roseville, CA 95678

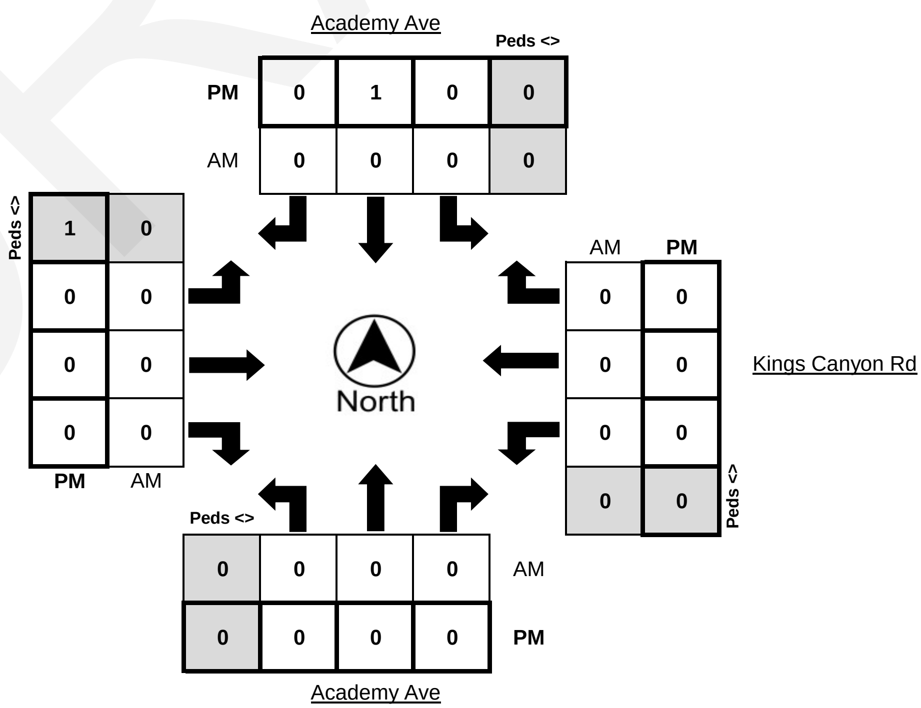
LOCATION	Kings Canyon Rd @ Academy Ave	**LATITUDE**	36.7360
COUNTY	Fresno	**LONGITUDE**	-119.5563
COLLECTION DATE	Thursday, January 11, 2018	**WEATHER**	Clear

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
7:00 AM - 7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM - 7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM - 7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM - 8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM - 8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM - 8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM - 8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM - 9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
4:00 PM - 4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM - 4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM - 4:45 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
4:45 PM - 5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM - 5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM - 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM - 5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM - 6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
PEAK HOUR	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
7:15 AM - 8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM - 5:15 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1

	Bikes	Peds
AM Peak Total	0	0
PM Peak Total	1	1



Turning Movement Report

Metro Traffic Data Inc.
310 N. Irwin Street - Suite 20
Hanford, CA 93230

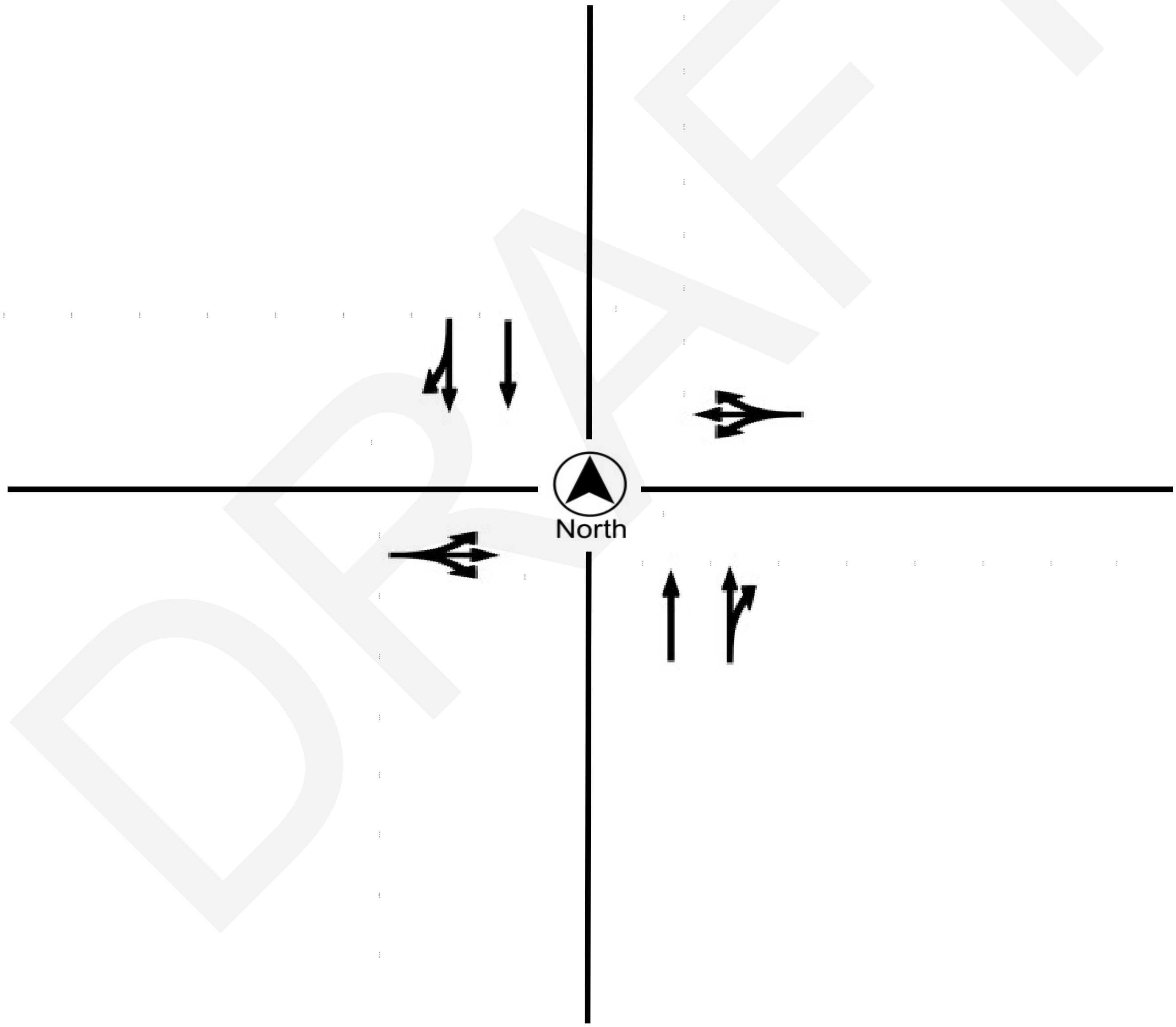
800-975-6938 Phone/Fax
www.metrotrafficdata.com

Prepared For:

OMNI-Means
943 Reserve Drive
Roseville, CA 95678

LOCATION	Kings Canyon Rd @ Academy Ave	**N/S STREET**	Academy Ave
COUNTY	Fresno	**E/W STREET**	Kings Canyon Rd
COLLECTION DATE	Thursday, January 11, 2018	**WEATHER**	Clear
CYCLE TIME	125 Seconds	**CONTROL TYPE**	Signal

COMMENTS All approaches have protected left turns.



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Turning Movement Report

Prepared For:
OMNI-Means
943 Reserve Drive
Roseville, CA 95678

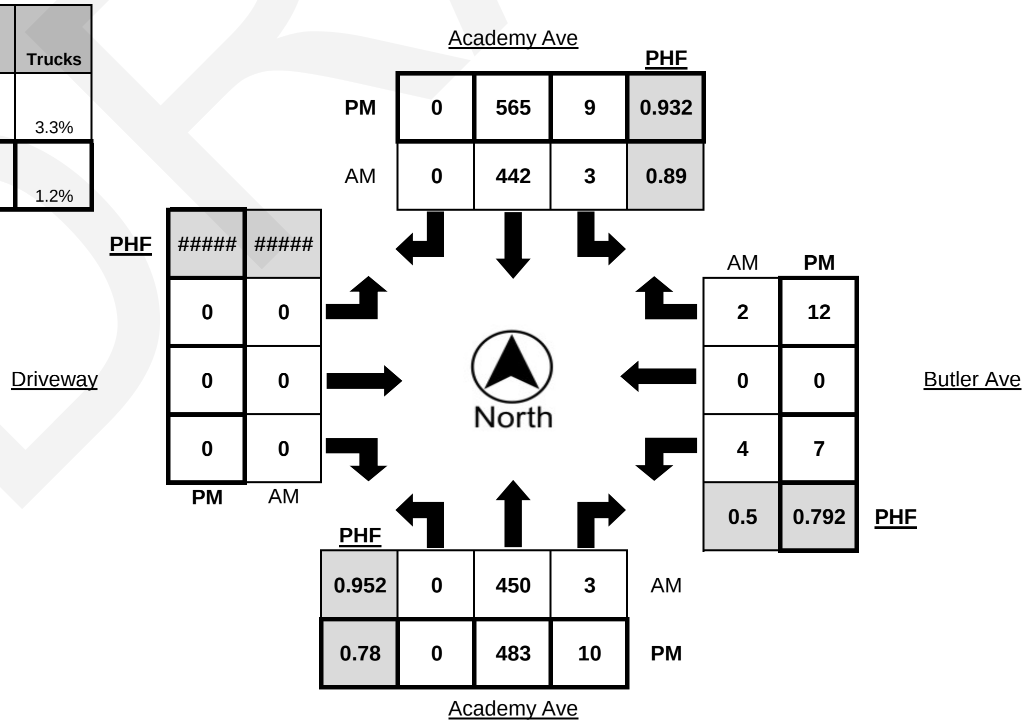
LOCATION	Academy Ave @ Butler Ave	**LATITUDE**	36.7285
COUNTY	Fresno	**LONGITUDE**	-119.5564
COLLECTION DATE	Thursday, January 11, 2018	**WEATHER**	Clear

	Northbound				Southbound				Eastbound				Westbound			
Time	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**
7:00 AM - 7:15 AM	0	110	0	0	0	85	0	1	0	0	0	0	0	0	0	0
7:15 AM - 7:30 AM	0	113	0	4	0	125	0	5	0	0	0	0	0	0	0	0
7:30 AM - 7:45 AM	0	114	0	2	1	96	0	0	0	0	0	0	2	0	1	0
7:45 AM - 8:00 AM	0	104	3	6	1	114	0	8	0	0	0	0	1	0	1	0
8:00 AM - 8:15 AM	0	119	0	3	1	107	0	2	0	0	0	0	1	0	0	0
8:15 AM - 8:30 AM	0	84	1	2	0	112	0	7	0	0	0	0	0	0	0	0
8:30 AM - 8:45 AM	0	73	1	6	2	92	0	5	0	0	0	0	0	0	1	0
8:45 AM - 9:00 AM	0	88	1	4	1	102	0	2	0	0	0	0	0	0	1	1
TOTAL	**0**	**805**	**6**	**27**	**6**	**833**	**0**	**30**	**0**	**0**	**0**	**0**	**4**	**0**	**4**	**1**

	Northbound				Southbound				Eastbound				Westbound			
Time	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**
4:00 PM - 4:15 PM	0	144	2	3	3	129	0	5	0	0	0	0	5	0	4	0
4:15 PM - 4:30 PM	0	129	4	1	4	122	0	1	0	0	0	0	2	0	3	0
4:30 PM - 4:45 PM	0	110	2	1	6	124	1	5	0	0	0	0	3	0	2	0
4:45 PM - 5:00 PM	0	91	2	2	1	147	0	4	0	0	0	0	1	0	4	0
5:00 PM - 5:15 PM	0	155	3	2	4	135	0	0	0	0	0	0	2	0	4	0
5:15 PM - 5:30 PM	0	116	2	1	2	131	0	0	0	0	0	0	3	0	1	0
5:30 PM - 5:45 PM	0	121	3	1	2	152	0	3	0	0	0	0	1	0	3	0
5:45 PM - 6:00 PM	0	92	1	0	0	120	0	0	0	0	0	0	2	0	3	0
TOTAL	**0**	**958**	**19**	**11**	**22**	**1060**	**1**	**18**	**0**	**0**	**0**	**0**	**19**	**0**	**24**	**0**

	Northbound				Southbound				Eastbound				Westbound			
PEAK HOUR	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**
7:15 AM - 8:15 AM	0	450	3	15	3	442	0	15	0	0	0	0	4	0	2	0
4:45 PM - 5:45 PM	0	483	10	6	9	565	0	7	0	0	0	0	7	0	12	0

	PHF	**Trucks**
AM	0.950	3.3%
PM	0.896	1.2%



Metro Traffic Data Inc.
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Turning Movement Report

Prepared For:

OMNI-Means
943 Reserve Drive
Roseville, CA 95678

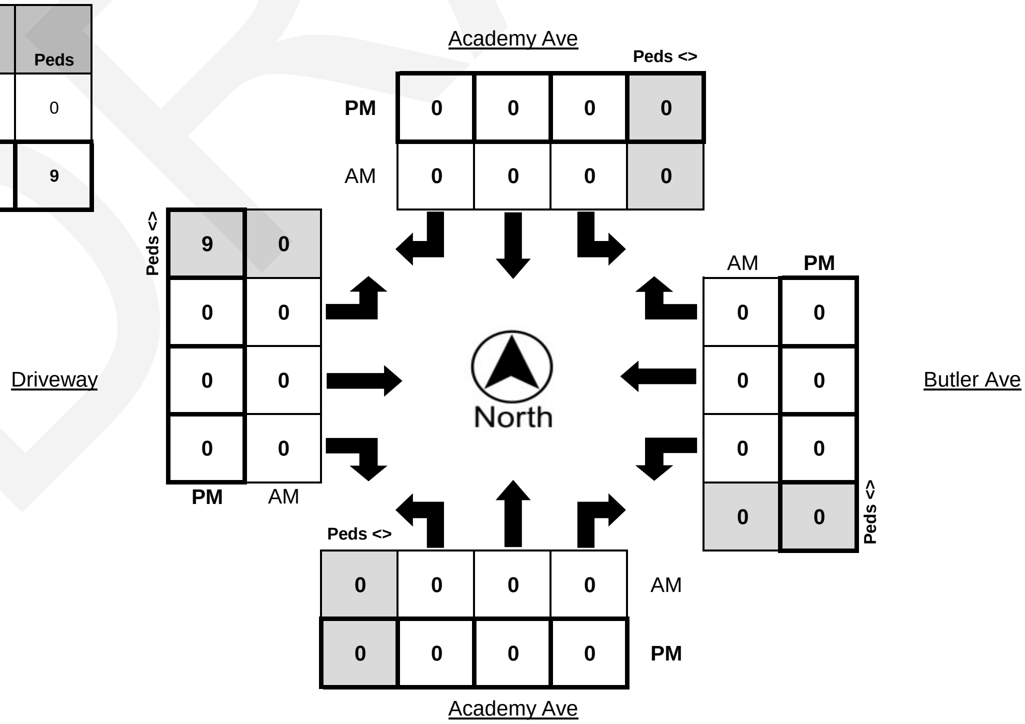
LOCATION	Academy Ave @ Butler Ave	**LATITUDE**	36.7285
COUNTY	Fresno	**LONGITUDE**	-119.5564
COLLECTION DATE	Thursday, January 11, 2018	**WEATHER**	Clear

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
7:00 AM - 7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM - 7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM - 7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM - 8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM - 8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM - 8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM - 8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM - 9:00 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
4:00 PM - 4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM - 4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM - 4:45 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	6
4:45 PM - 5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
5:00 PM - 5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM - 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:30 PM - 5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM - 6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**15**

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
PEAK HOUR	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
7:15 AM - 8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM - 5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9

	Bikes	Peds
AM Peak Total	0	0
PM Peak Total	0	9



Metro Traffic Data Inc.
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Hanford, CA 93230

800-975-6938 Phone/Fax
www.metrotrafficdata.com

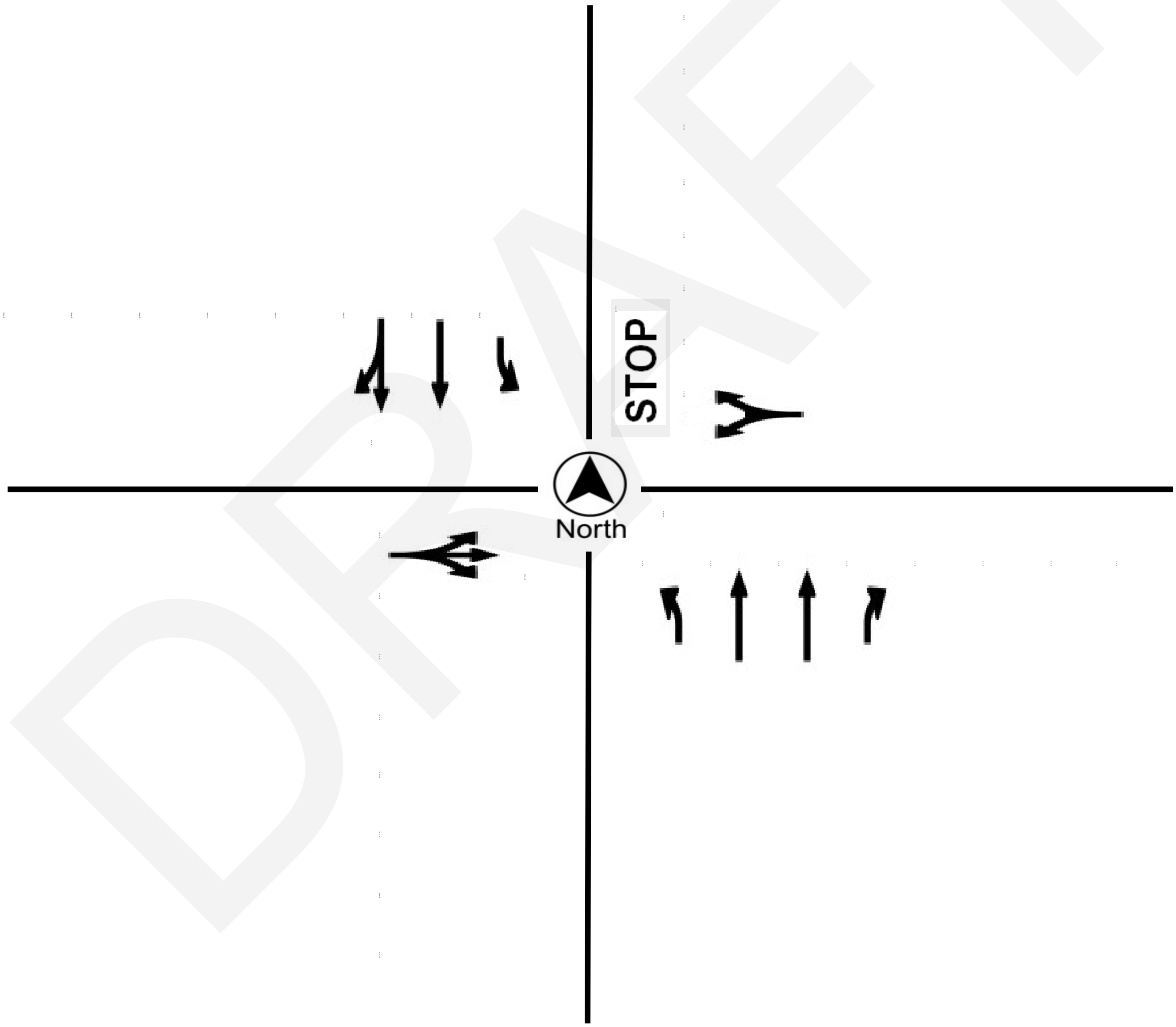
Turning Movement Report

Prepared For:

OMNI-Means
943 Reserve Drive
Roseville, CA 95678

LOCATION	Academy Ave @ Butler Ave	**N/S STREET**	Academy Ave
COUNTY	Fresno	**E/W STREET**	Butler Ave
COLLECTION DATE	Thursday, January 11, 2018	**WEATHER**	Clear
CYCLE TIME	N/A	**CONTROL TYPE**	One-Way Stop

COMMENTS



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Turning Movement Report

Prepared For:

OMNI-Means
943 Reserve Drive
Roseville, CA 95678

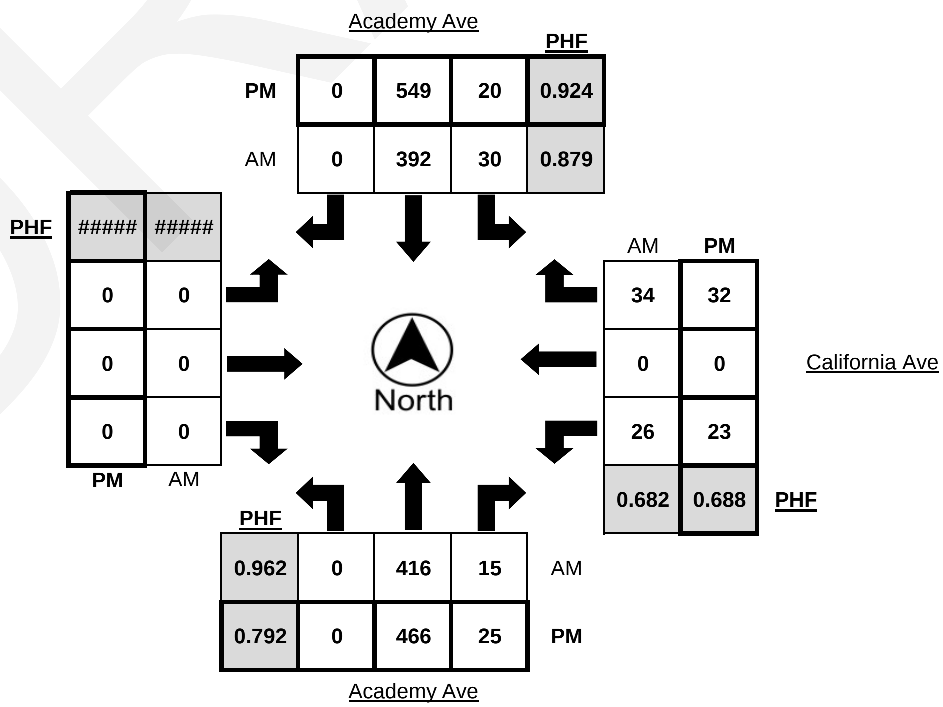
LOCATION Academy Ave @ California Ave
LATITUDE 36.7213
COUNTY Fresno
LONGITUDE -119.5565
COLLECTION DATE Thursday, January 11, 2018
WEATHER Clear

	Northbound				Southbound				Eastbound				Westbound			
Time	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks
7:00 AM - 7:15 AM	0	105	2	0	5	81	0	1	0	0	0	0	4	0	7	0
7:15 AM - 7:30 AM	0	107	0	4	6	114	0	4	0	0	0	0	4	0	3	0
7:30 AM - 7:45 AM	0	108	4	3	8	86	0	0	0	0	0	0	5	0	10	0
7:45 AM - 8:00 AM	0	100	3	5	9	98	0	8	0	0	0	0	7	0	9	1
8:00 AM - 8:15 AM	0	101	8	3	7	94	0	1	0	0	0	0	10	0	12	0
8:15 AM - 8:30 AM	0	84	8	4	6	110	0	7	0	0	0	0	4	0	3	1
8:30 AM - 8:45 AM	0	72	8	4	3	94	0	7	0	0	0	0	14	0	4	0
8:45 AM - 9:00 AM	0	88	1	3	1	101	0	2	0	0	0	0	9	0	6	2
TOTAL	**0**	**765**	**34**	**26**	**45**	**778**	**0**	**30**	**0**	**0**	**0**	**0**	**57**	**0**	**54**	**4**

	Northbound				Southbound				Eastbound				Westbound			
Time	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks
4:00 PM - 4:15 PM	0	133	5	0	7	126	0	5	0	0	0	0	6	0	8	1
4:15 PM - 4:30 PM	0	118	7	1	6	118	0	1	0	0	0	0	7	0	13	0
4:30 PM - 4:45 PM	0	109	8	2	7	122	0	5	0	0	0	0	9	0	6	0
4:45 PM - 5:00 PM	0	89	5	1	8	141	0	4	0	0	0	0	5	0	10	0
5:00 PM - 5:15 PM	0	148	7	2	4	136	0	0	0	0	0	0	3	0	8	0
5:15 PM - 5:30 PM	0	109	5	1	3	123	0	0	0	0	0	0	4	0	5	0
5:30 PM - 5:45 PM	0	120	8	1	5	149	0	4	0	0	0	0	11	0	9	1
5:45 PM - 6:00 PM	0	90	6	1	5	123	0	1	0	0	0	0	11	0	6	1
TOTAL	**0**	**916**	**51**	**9**	**45**	**1038**	**0**	**20**	**0**	**0**	**0**	**0**	**56**	**0**	**65**	**3**

	Northbound				Southbound				Eastbound				Westbound			
PEAK HOUR	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks
7:15 AM - 8:15 AM	0	416	15	15	30	392	0	13	0	0	0	0	26	0	34	1
4:45 PM - 5:45 PM	0	466	25	5	20	549	0	8	0	0	0	0	23	0	32	1

	PHF	Trucks
AM	0.975	3.2%
PM	0.911	1.3%



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Turning Movement Report

Prepared For:

OMNI-Means
943 Reserve Drive
Roseville, CA 95678

LOCATION	Academy Ave @ California Ave	**LATITUDE**	36.7213
COUNTY	Fresno	**LONGITUDE**	-119.5565
COLLECTION DATE	Thursday, January 11, 2018	**WEATHER**	Clear

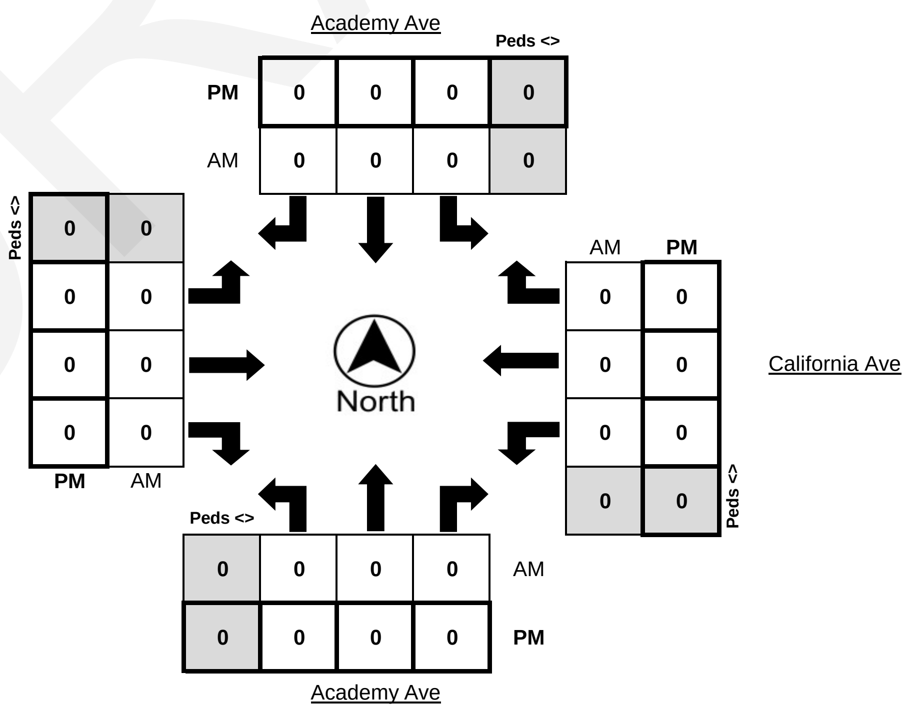
	Northbound Bikes			N.Leg Peds	Southbound Bikes			S.Leg Peds	Eastbound Bikes			E.Leg Peds	Westbound Bikes			W.Leg Peds
Time	Left	Thru	Right		Left	Thru	Right		Left	Thru	Right		Left	Thru	Right	
7:00 AM - 7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM - 7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM - 7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM - 8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM - 8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM - 8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM - 8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM - 9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

	Northbound Bikes			N.Leg Peds	Southbound Bikes			S.Leg Peds	Eastbound Bikes			E.Leg Peds	Westbound Bikes			W.Leg Peds
Time	Left	Thru	Right		Left	Thru	Right		Left	Thru	Right		Left	Thru	Right	
4:00 PM - 4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM - 4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM - 4:45 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
4:45 PM - 5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM - 5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM - 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM - 5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM - 6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

	Northbound Bikes			N.Leg Peds	Southbound Bikes			S.Leg Peds	Eastbound Bikes			E.Leg Peds	Westbound Bikes			W.Leg Peds
PEAK HOUR	Left	Thru	Right		Left	Thru	Right		Left	Thru	Right		Left	Thru	Right	
7:15 AM - 8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM - 5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Bikes	Peds
AM Peak Total	0	0
PM Peak Total	0	0

0



Metro Traffic Data Inc.
310 N. Irwin Street - Suite 20
Hanford, CA 93230

800-975-6938 Phone/Fax
www.metrotrafficdata.com

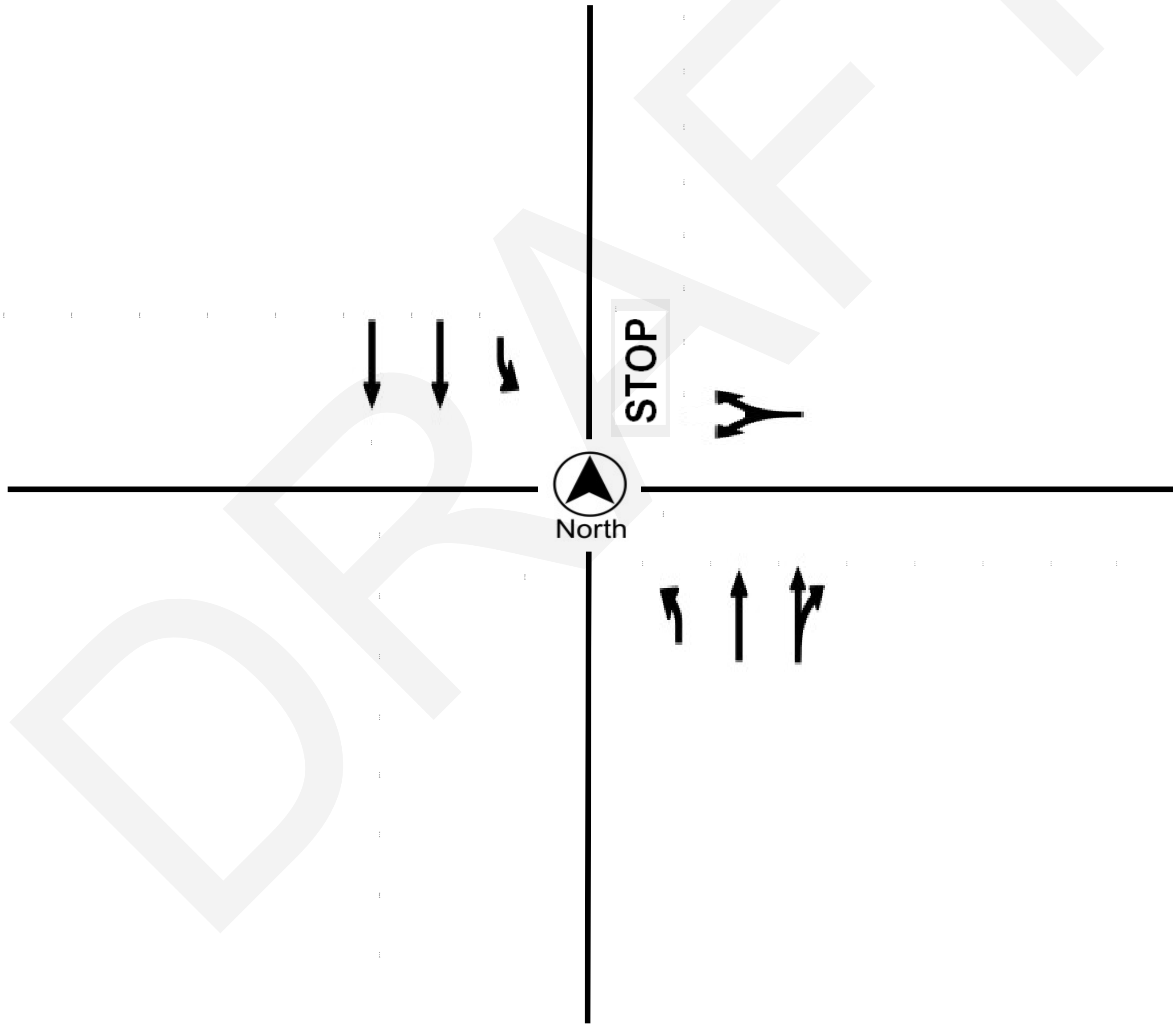
Turning Movement Report

Prepared For:

OMNI-Means
943 Reserve Drive
Roseville, CA 95678

LOCATION	Academy Ave @ California Ave	**N/S STREET**	Academy Ave
COUNTY	Fresno	**E/W STREET**	California Ave
COLLECTION DATE	Thursday, January 11, 2018	**WEATHER**	Clear
CYCLE TIME	N/A	**CONTROL TYPE**	One-Way Stop

COMMENTS



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Turning Movement Report

Prepared For:

OMNI-Means
943 Reserve Drive
Roseville, CA 95678

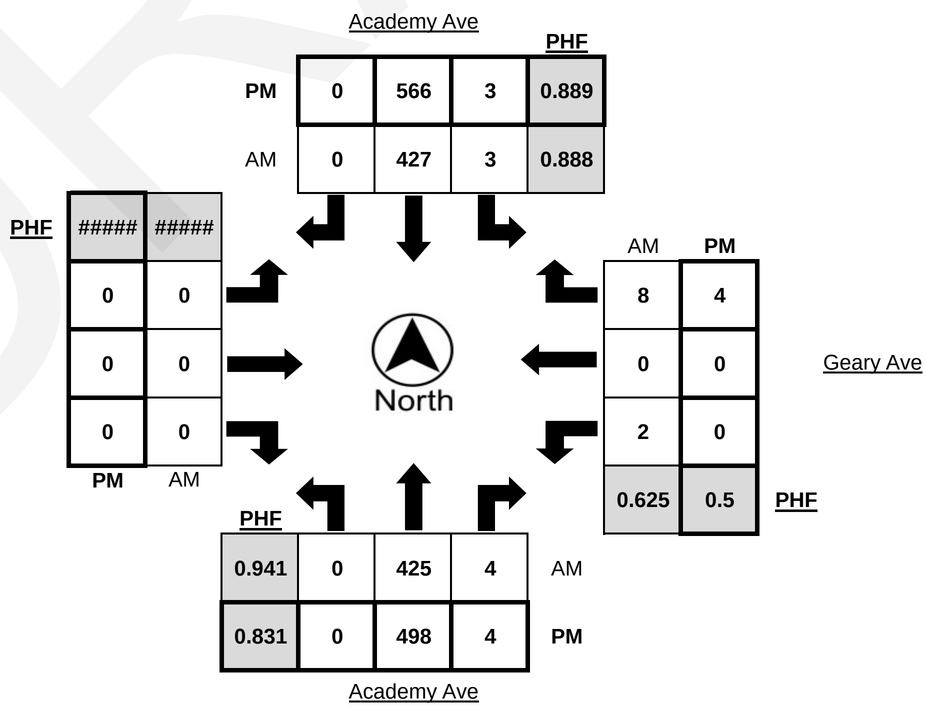
LOCATION Academy Ave @ Geary Ave
LATITUDE 36.7185
COUNTY Fresno
LONGITUDE -119.5565
COLLECTION DATE Thursday, January 11, 2018
WEATHER Clear

	Northbound				Southbound				Eastbound				Westbound			
Time	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**
7:00 AM - 7:15 AM	0	104	3	0	1	84	0	1	0	0	0	0	0	0	2	0
7:15 AM - 7:30 AM	0	106	1	4	1	120	0	5	0	0	0	0	0	0	0	0
7:30 AM - 7:45 AM	0	113	1	3	1	92	0	1	0	0	0	0	1	0	3	0
7:45 AM - 8:00 AM	0	99	1	5	1	110	0	7	0	0	0	0	1	0	3	0
8:00 AM - 8:15 AM	0	107	1	3	0	105	0	1	0	0	0	0	0	0	2	0
8:15 AM - 8:30 AM	0	89	1	4	1	108	0	7	0	0	0	0	0	0	3	0
8:30 AM - 8:45 AM	0	78	0	5	0	109	0	8	0	0	0	0	0	0	0	0
8:45 AM - 9:00 AM	0	100	0	4	0	112	0	3	0	0	0	0	0	0	1	0
TOTAL	**0**	**796**	**8**	**28**	**5**	**840**	**0**	**33**	**0**	**0**	**0**	**0**	**2**	**0**	**14**	**0**

	Northbound				Southbound				Eastbound				Westbound			
Time	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**
4:00 PM - 4:15 PM	0	141	1	1	1	133	0	5	0	0	0	0	1	0	0	0
4:15 PM - 4:30 PM	0	120	3	1	1	125	0	2	0	0	0	0	1	0	1	0
4:30 PM - 4:45 PM	0	116	1	2	2	126	0	5	0	0	0	0	1	0	0	0
4:45 PM - 5:00 PM	0	102	1	2	0	145	0	4	0	0	0	0	0	0	1	0
5:00 PM - 5:15 PM	0	148	3	1	1	137	0	0	0	0	0	0	0	0	2	0
5:15 PM - 5:30 PM	0	115	0	1	1	125	0	0	0	0	0	0	0	0	0	0
5:30 PM - 5:45 PM	0	133	0	1	1	159	0	4	0	0	0	0	0	0	1	0
5:45 PM - 6:00 PM	0	91	1	0	1	134	0	2	0	0	0	0	1	0	2	0
TOTAL	**0**	**966**	**10**	**9**	**8**	**1084**	**0**	**22**	**0**	**0**	**0**	**0**	**4**	**0**	**7**	**0**

	Northbound				Southbound				Eastbound				Westbound			
PEAK HOUR	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**
7:15 AM - 8:15 AM	0	425	4	15	3	427	0	14	0	0	0	0	2	0	8	0
4:45 PM - 5:45 PM	0	498	4	5	3	566	0	8	0	0	0	0	0	0	4	0

	PHF	**Trucks**
AM	0.953	3.3%
PM	0.914	1.2%



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Turning Movement Report

Prepared For:

OMNI-Means
943 Reserve Drive
Roseville, CA 95678

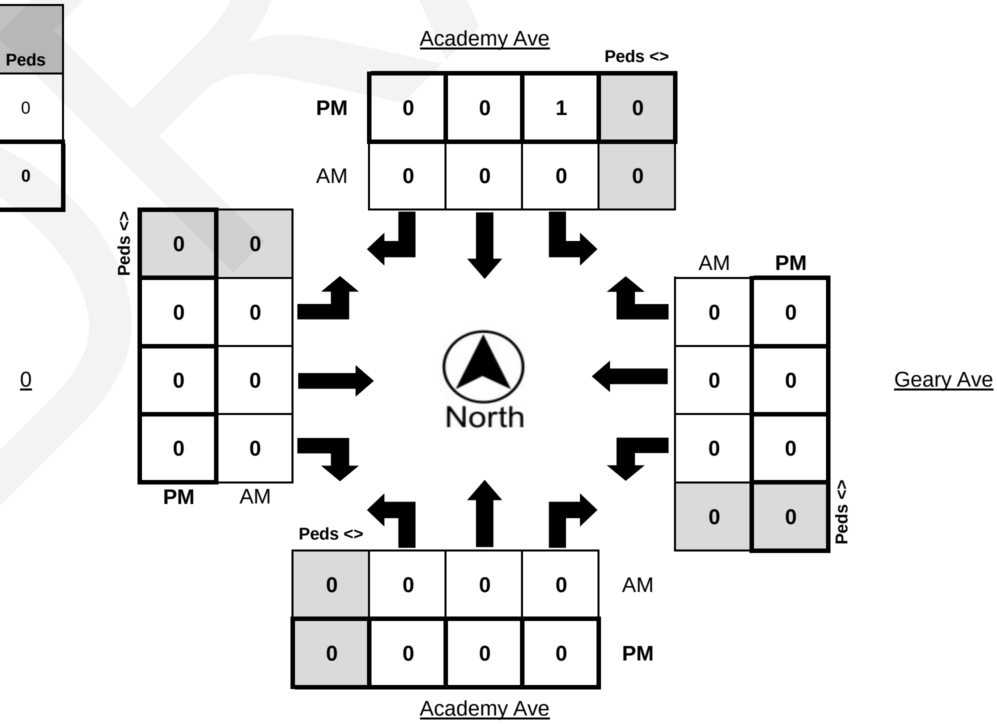
LOCATION Academy Ave @ Geary Ave
LATITUDE 36.7185
COUNTY Fresno
LONGITUDE -119.5565
COLLECTION DATE Thursday, January 11, 2018
WEATHER Clear

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
7:00 AM - 7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM - 7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM - 7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM - 8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM - 8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM - 8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM - 8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM - 9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
4:00 PM - 4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM - 4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM - 4:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
4:45 PM - 5:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
5:00 PM - 5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM - 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM - 5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM - 6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
PEAK HOUR	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
7:15 AM - 8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM - 5:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0

	Bikes	Peds
AM Peak Total	0	0
PM Peak Total	**1**	**0**



Turning Movement Report

Metro Traffic Data Inc.
310 N. Irwin Street - Suite 20
Hanford, CA 93230

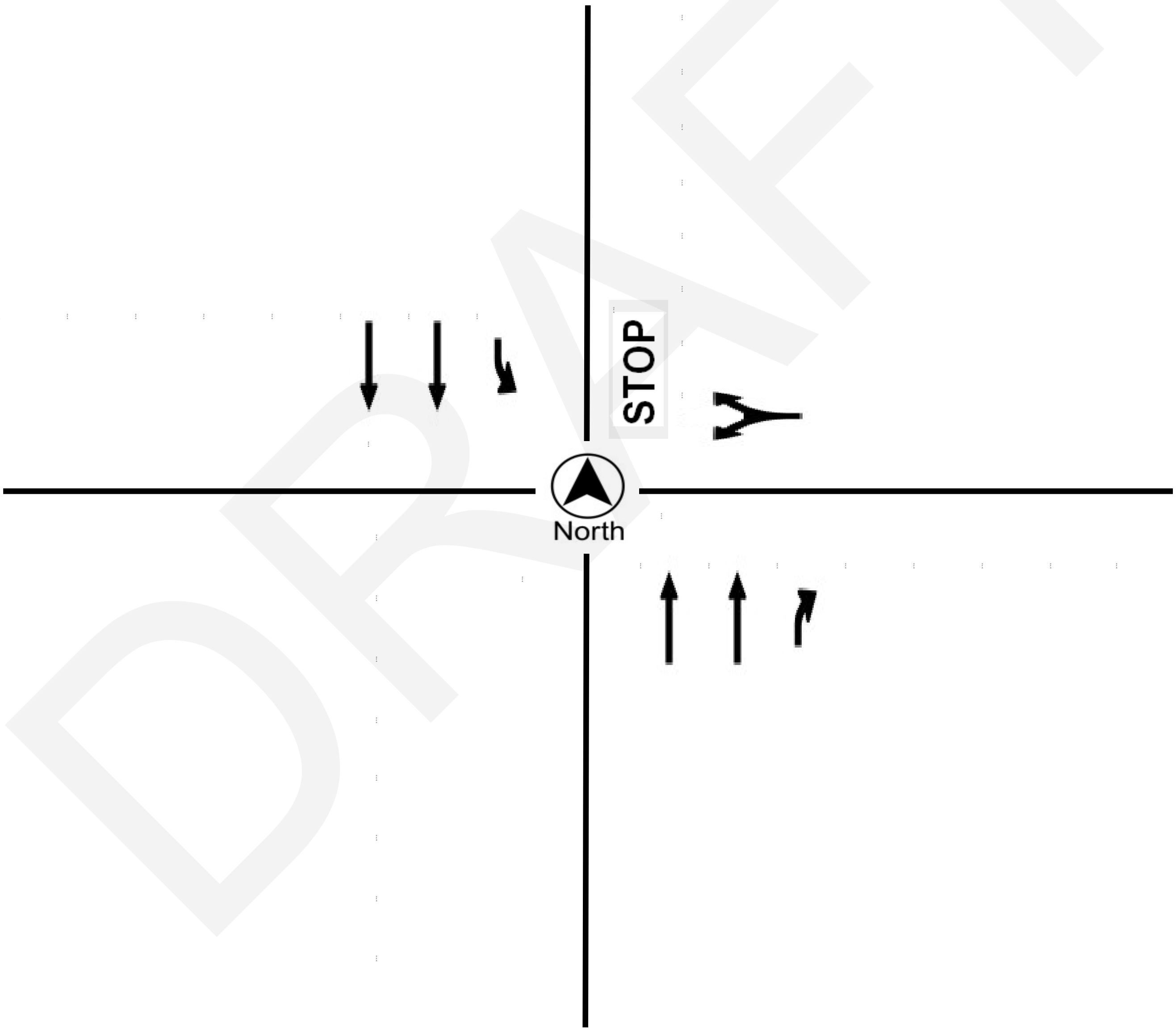
800-975-6938 Phone/Fax
www.metrotrafficdata.com

Prepared For:

OMNI-Means
943 Reserve Drive
Roseville, CA 95678

LOCATION	Academy Ave @ Geary Ave	**N/S STREET**	Academy Ave
COUNTY	Fresno	**E/W STREET**	Geary Ave
COLLECTION DATE	Thursday, January 11, 2018	**WEATHER**	Clear
CYCLE TIME	N/A	**CONTROL TYPE**	One-Way Stop

COMMENTS



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Turning Movement Report

Prepared For:

OMNI-Means
943 Reserve Drive
Roseville, CA 95678

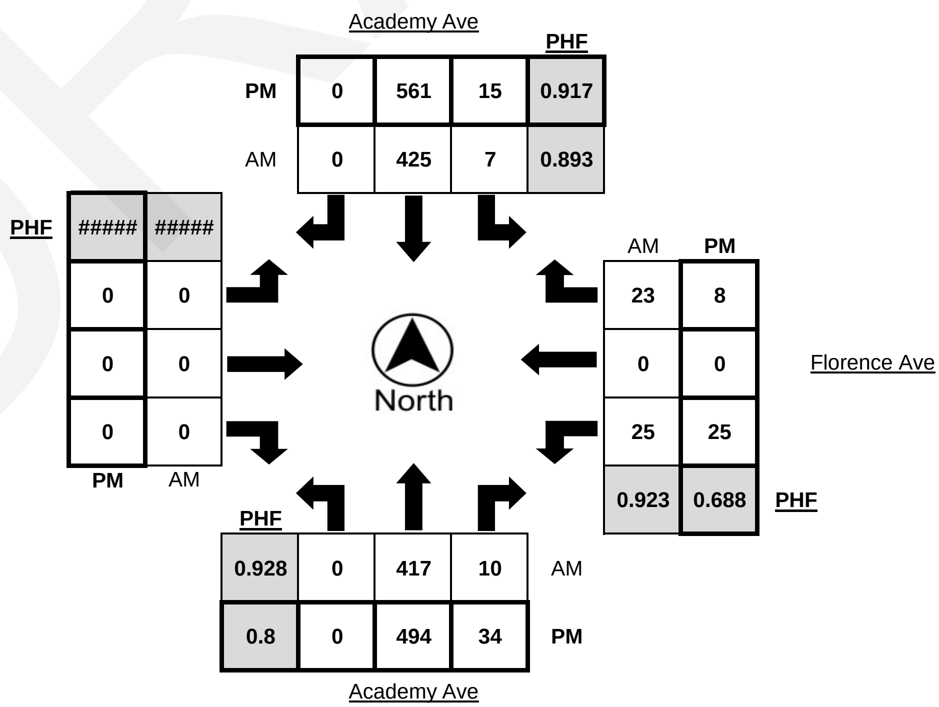
LOCATION	Academy Ave @ Florence Ave	**LATITUDE**	36.7176
COUNTY	Fresno	**LONGITUDE**	-119.5566
COLLECTION DATE	Thursday, January 11, 2018	**WEATHER**	Clear

	Northbound				Southbound				Eastbound				Westbound			
Time	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks
7:00 AM - 7:15 AM	0	104	2	0	2	81	0	1	0	0	0	0	5	0	3	0
7:15 AM - 7:30 AM	0	103	0	4	1	120	0	4	0	0	0	0	6	0	6	0
7:30 AM - 7:45 AM	0	111	4	4	2	95	0	0	0	0	0	0	8	0	5	0
7:45 AM - 8:00 AM	0	98	4	5	2	108	0	7	0	0	0	0	7	0	5	1
8:00 AM - 8:15 AM	0	105	2	3	2	102	0	1	0	0	0	0	4	0	7	0
8:15 AM - 8:30 AM	0	86	2	4	3	108	0	7	0	0	0	0	1	0	7	0
8:30 AM - 8:45 AM	0	81	3	5	1	110	0	7	0	0	0	0	4	0	2	0
8:45 AM - 9:00 AM	0	93	3	3	0	112	0	3	0	0	0	0	5	0	3	0
TOTAL	**0**	**781**	**20**	**28**	**13**	**836**	**0**	**30**	**0**	**0**	**0**	**0**	**40**	**0**	**38**	**1**

	Northbound				Southbound				Eastbound				Westbound			
Time	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks
4:00 PM - 4:15 PM	0	129	5	1	7	133	0	3	0	0	0	0	2	0	3	0
4:15 PM - 4:30 PM	0	128	2	1	3	114	0	2	0	0	0	0	3	0	2	0
4:30 PM - 4:45 PM	0	114	9	1	4	133	0	5	0	0	0	0	7	0	4	1
4:45 PM - 5:00 PM	0	102	0	1	4	144	0	4	0	0	0	0	7	0	1	0
5:00 PM - 5:15 PM	0	153	12	2	4	139	0	0	0	0	0	0	4	0	0	0
5:15 PM - 5:30 PM	0	113	8	1	3	125	0	0	0	0	0	0	8	0	4	0
5:30 PM - 5:45 PM	0	126	14	0	4	153	0	1	0	0	0	0	6	0	3	0
5:45 PM - 6:00 PM	0	89	8	0	3	140	0	2	0	0	0	0	4	0	3	0
TOTAL	**0**	**954**	**58**	**7**	**32**	**1081**	**0**	**17**	**0**	**0**	**0**	**0**	**41**	**0**	**20**	**1**

	Northbound				Southbound				Eastbound				Westbound			
PEAK HOUR	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks
7:15 AM - 8:15 AM	0	417	10	16	7	425	0	12	0	0	0	0	25	0	23	1
4:45 PM - 5:45 PM	0	494	34	4	15	561	0	5	0	0	0	0	25	0	8	0

	PHF	Trucks
AM	0.961	3.2%
PM	0.911	0.8%



Turning Movement Report

Metro Traffic Data Inc.
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Hanford, CA 93230

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www.metrotrafficdata.com

Prepared For:

OMNI-Means
943 Reserve Drive
Roseville, CA 95678

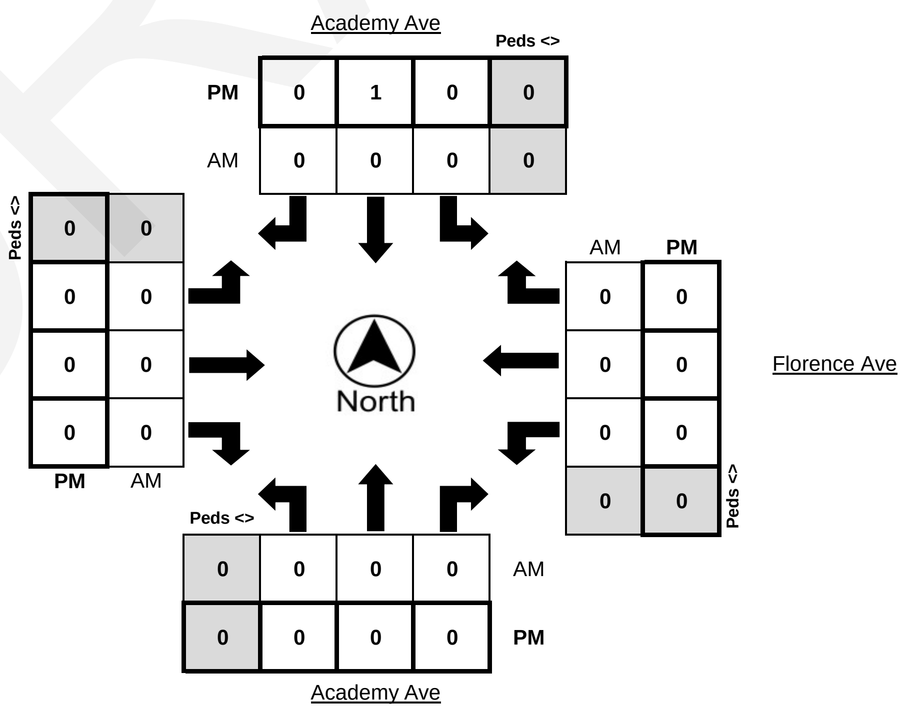
LOCATION	Academy Ave @ Florence Ave	**LATITUDE**	36.7176
COUNTY	Fresno	**LONGITUDE**	-119.5566
COLLECTION DATE	Thursday, January 11, 2018	**WEATHER**	Clear

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
Time	**Left**	**Thru**	**Right**	**Peds**	**Left**	**Thru**	**Right**	**Peds**	**Left**	**Thru**	**Right**	**Peds**	**Left**	**Thru**	**Right**	**Peds**
7:00 AM - 7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM - 7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM - 7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM - 8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM - 8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM - 8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM - 8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM - 9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
Time	**Left**	**Thru**	**Right**	**Peds**	**Left**	**Thru**	**Right**	**Peds**	**Left**	**Thru**	**Right**	**Peds**	**Left**	**Thru**	**Right**	**Peds**
4:00 PM - 4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM - 4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM - 4:45 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
4:45 PM - 5:00 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
5:00 PM - 5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM - 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM - 5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM - 6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
PEAK HOUR	**Left**	**Thru**	**Right**	**Peds**	**Left**	**Thru**	**Right**	**Peds**	**Left**	**Thru**	**Right**	**Peds**	**Left**	**Thru**	**Right**	**Peds**
7:15 AM - 8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM - 5:45 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

	Bikes	**Peds**
AM Peak Total	0	0
PM Peak Total	**1**	**0**



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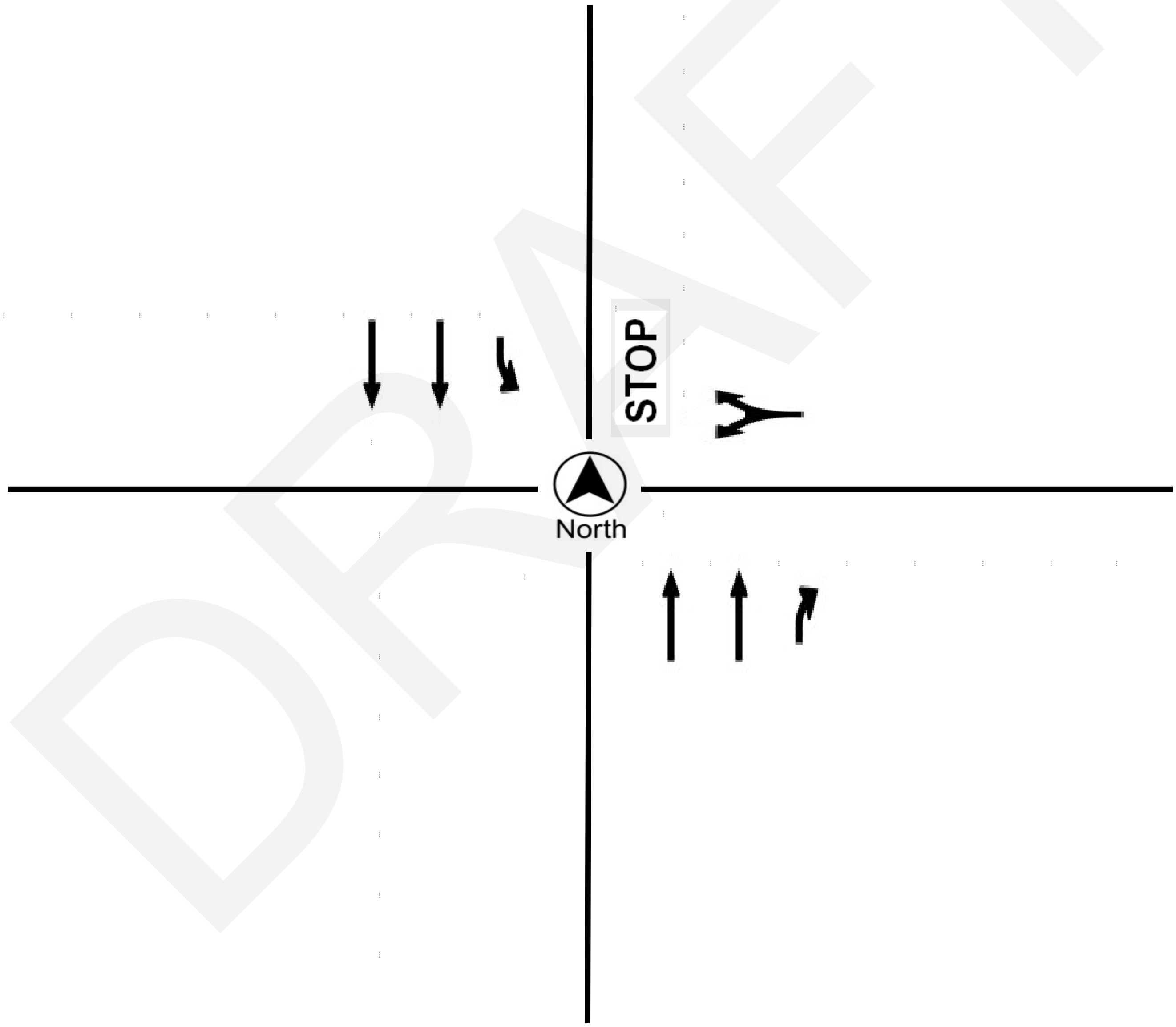
Turning Movement Report

Prepared For:

OMNI-Means
943 Reserve Drive
Roseville, CA 95678

LOCATION	Academy Ave @ Florence Ave	**N/S STREET**	Academy Ave
COUNTY	Fresno	**E/W STREET**	Florence Ave
COLLECTION DATE	Thursday, January 11, 2018	**WEATHER**	Clear
CYCLE TIME	N/A	**CONTROL TYPE**	One-Way Stop

COMMENTS



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Turning Movement Report

Prepared For:
OMNI-Means
943 Reserve Drive
Roseville, CA 95678

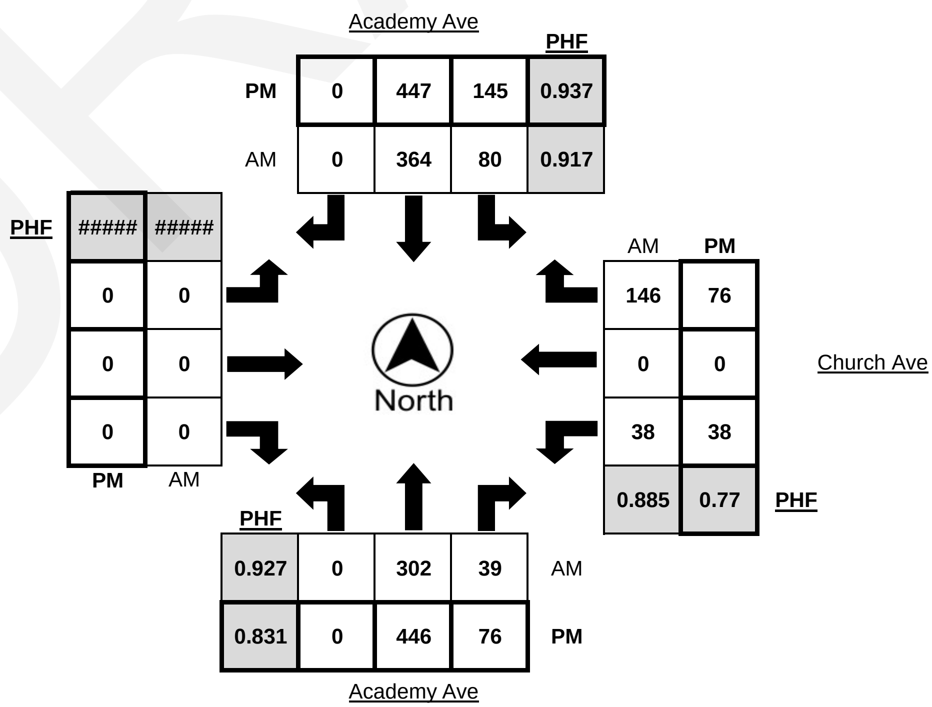
LOCATION Academy Ave @ Church Ave
LATITUDE 36.7140
COUNTY Fresno
LONGITUDE -119.5565
COLLECTION DATE Thursday, January 11, 2018
WEATHER Clear

	Northbound				Southbound				Eastbound				Westbound			
Time	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks
7:00 AM - 7:15 AM	0	72	4	1	19	64	0	1	0	0	0	0	7	0	40	0
7:15 AM - 7:30 AM	0	64	4	4	24	97	0	4	0	0	0	0	11	0	34	0
7:30 AM - 7:45 AM	0	83	7	4	21	83	0	0	0	0	0	0	12	0	35	1
7:45 AM - 8:00 AM	0	79	12	3	23	90	0	7	0	0	0	0	12	0	28	0
8:00 AM - 8:15 AM	0	76	16	3	12	94	0	0	0	0	0	0	3	0	49	0
8:15 AM - 8:30 AM	0	75	13	5	9	102	0	8	0	0	0	0	7	0	14	0
8:30 AM - 8:45 AM	0	59	8	4	9	107	0	7	0	0	0	0	9	0	21	0
8:45 AM - 9:00 AM	0	82	12	0	20	99	0	4	0	0	0	0	12	0	19	0
TOTAL	**0**	**590**	**76**	**24**	**137**	**736**	**0**	**31**	**0**	**0**	**0**	**0**	**73**	**0**	**240**	**1**

	Northbound				Southbound				Eastbound				Westbound			
Time	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks
4:00 PM - 4:15 PM	0	114	20	0	33	103	0	5	0	0	0	0	11	0	34	0
4:15 PM - 4:30 PM	0	106	17	1	32	90	0	2	0	0	0	0	13	0	15	0
4:30 PM - 4:45 PM	0	107	21	1	32	118	0	4	0	0	0	0	11	0	20	0
4:45 PM - 5:00 PM	0	84	9	0	27	128	0	5	0	0	0	0	9	0	14	0
5:00 PM - 5:15 PM	0	138	19	3	37	107	0	1	0	0	0	0	4	0	21	0
5:15 PM - 5:30 PM	0	100	16	1	32	111	0	0	0	0	0	0	13	0	24	0
5:30 PM - 5:45 PM	0	115	19	1	38	120	0	1	0	0	0	0	10	0	24	0
5:45 PM - 6:00 PM	0	93	22	0	38	109	0	2	0	0	0	0	11	0	7	0
TOTAL	**0**	**857**	**143**	**7**	**269**	**886**	**0**	**20**	**0**	**0**	**0**	**0**	**82**	**0**	**159**	**0**

	Northbound				Southbound				Eastbound				Westbound			
PEAK HOUR	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks
7:15 AM - 8:15 AM	0	302	39	14	80	364	0	11	0	0	0	0	38	0	146	1
5:00 PM - 6:00 PM	0	446	76	5	145	447	0	4	0	0	0	0	38	0	76	0

	PHF	Trucks
AM	0.969	2.7%
PM	0.942	0.7%



Metro Traffic Data Inc.
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800-975-6938 Phone/Fax
www.metrotrafficdata.com

Turning Movement Report

Prepared For:

OMNI-Means
943 Reserve Drive
Roseville, CA 95678

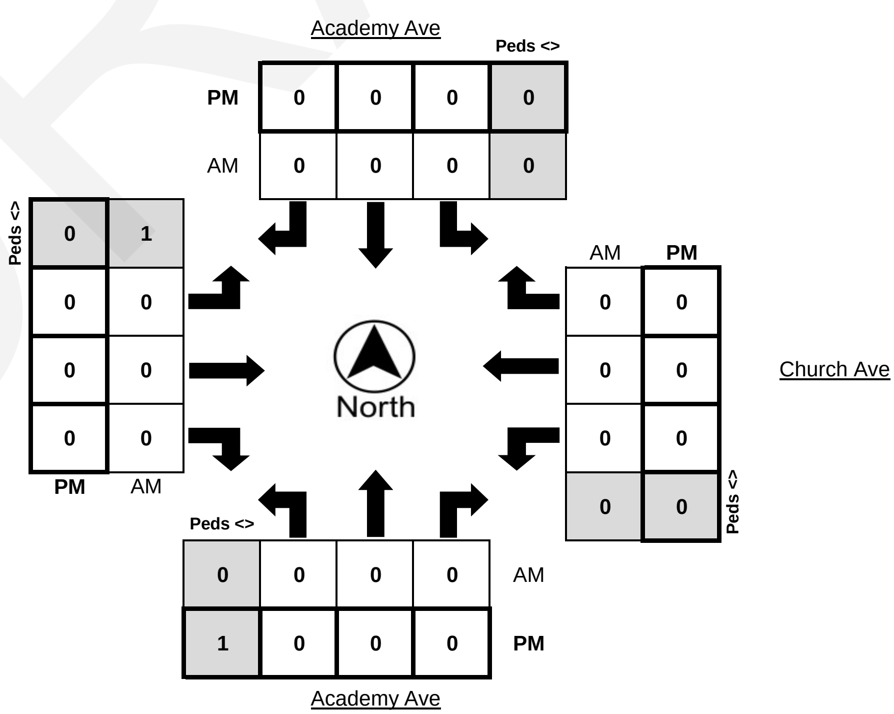
LOCATION	Academy Ave @ Church Ave	**LATITUDE**	36.7140
COUNTY	Fresno	**LONGITUDE**	-119.5565
COLLECTION DATE	Thursday, January 11, 2018	**WEATHER**	Clear

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
7:00 AM - 7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM - 7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM - 7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:45 AM - 8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM - 8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM - 8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM - 8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM - 9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
4:00 PM - 4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM - 4:30 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
4:30 PM - 4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM - 5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM - 5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM - 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM - 5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM - 6:00 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**0**

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
PEAK HOUR	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
7:15 AM - 8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:00 PM - 6:00 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

	Bikes	Peds
AM Peak Total	0	1
PM Peak Total	**0**	**1**



Metro Traffic Data Inc.
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www.metrotrafficdata.com

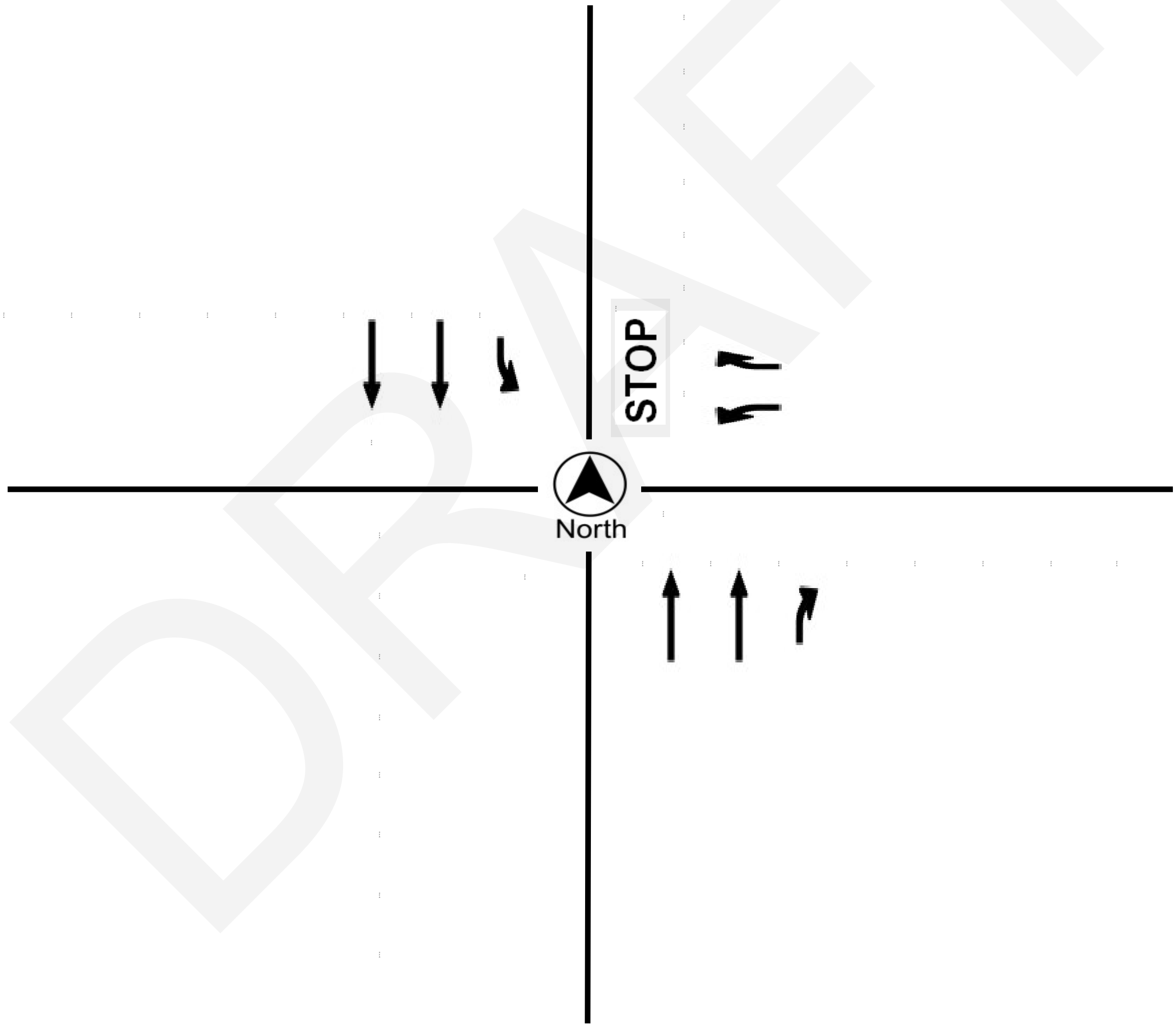
Turning Movement Report

Prepared For:

OMNI-Means
943 Reserve Drive
Roseville, CA 95678

LOCATION	Academy Ave @ Church Ave	**N/S STREET**	Academy Ave
COUNTY	Fresno	**E/W STREET**	Church Ave
COLLECTION DATE	Thursday, January 11, 2018	**WEATHER**	Clear
CYCLE TIME	N/A	**CONTROL TYPE**	One-Way Stop

COMMENTS



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Turning Movement Report

Prepared For:
GHD
30 River Park Place West Ste 220
Fresno, CA 93720

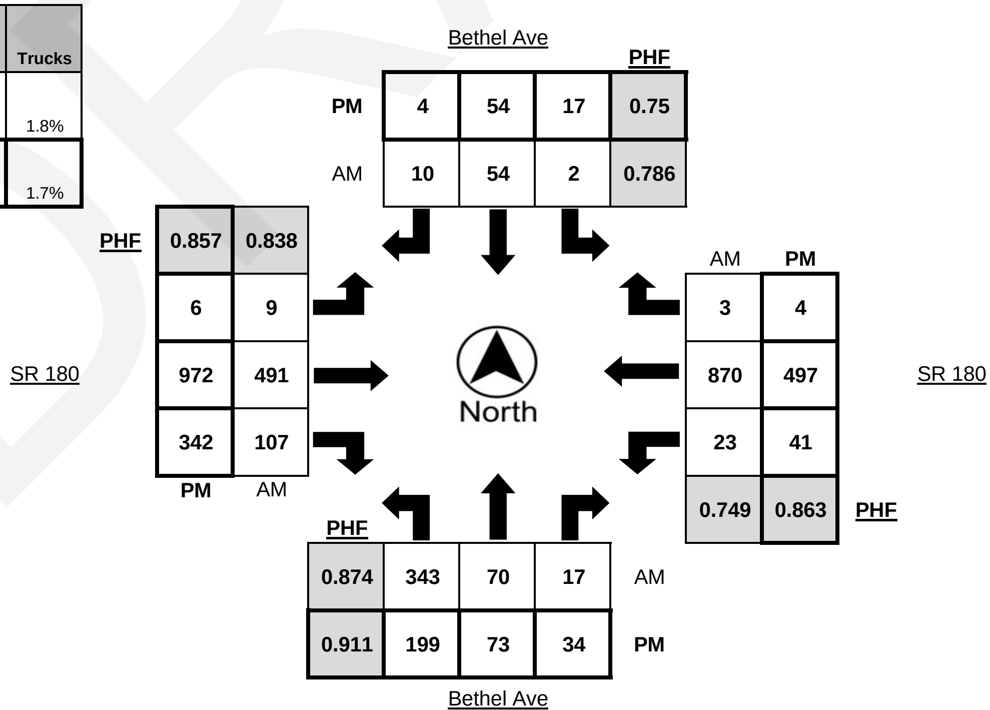
LOCATION	SR 180 @ Bethel Ave	**LATITUDE**	36.736037°
COUNTY	Fresno	**LONGITUDE**	-119.574157°
COLLECTION DATE	Wednesday, March 06, 2019	**WEATHER**	Clear

	Northbound				Southbound				Eastbound				Westbound			
Time	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**
7:00 AM - 7:15 AM	80	15	2	1	2	13	5	0	2	113	21	4	1	209	0	1
7:15 AM - 7:30 AM	87	16	3	1	0	16	2	0	0	126	33	8	9	289	1	3
7:30 AM - 7:45 AM	95	23	5	1	0	5	2	0	2	142	37	2	7	223	1	11
7:45 AM - 8:00 AM	81	16	7	0	0	20	1	0	5	110	16	3	6	149	1	1
8:00 AM - 8:15 AM	64	14	4	0	4	11	0	0	0	91	38	5	12	131	1	1
8:15 AM - 8:30 AM	67	4	3	0	0	18	0	1	1	144	42	6	12	165	1	2
8:30 AM - 8:45 AM	74	7	5	1	3	12	1	0	1	91	19	6	8	136	2	5
8:45 AM - 9:00 AM	57	9	4	1	0	21	1	0	0	57	38	3	14	115	0	3
TOTAL	**605**	**104**	**33**	**5**	**9**	**116**	**12**	**1**	**11**	**874**	**244**	**37**	**69**	**1417**	**7**	**27**

	Northbound				Southbound				Eastbound				Westbound			
Time	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**
4:00 PM - 4:15 PM	39	17	8	1	2	16	0	0	1	164	67	7	9	122	0	3
4:15 PM - 4:30 PM	38	16	2	0	1	15	2	0	1	205	71	4	10	112	1	1
4:30 PM - 4:45 PM	42	13	5	0	1	18	4	0	2	239	72	6	7	127	0	8
4:45 PM - 5:00 PM	41	10	5	1	0	16	0	1	1	235	68	7	6	112	0	2
5:00 PM - 5:15 PM	46	18	4	0	5	5	1	0	2	162	75	7	11	145	1	3
5:15 PM - 5:30 PM	53	13	9	0	3	15	1	0	0	284	101	6	9	131	1	4
5:30 PM - 5:45 PM	53	18	13	0	4	16	0	0	2	279	67	6	8	129	0	2
5:45 PM - 6:00 PM	47	24	8	3	5	18	2	0	2	247	99	6	13	92	2	1
TOTAL	**359**	**129**	**54**	**5**	**21**	**119**	**10**	**1**	**11**	**1815**	**620**	**49**	**73**	**970**	**5**	**24**

	Northbound				Southbound				Eastbound				Westbound			
PEAK HOUR	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**	**Left**	**Thru**	**Right**	**Trucks**
7:00 AM - 8:00 AM	343	70	17	3	2	54	10	0	9	491	107	17	23	870	3	16
5:00 PM - 6:00 PM	199	73	34	3	17	54	4	0	6	972	342	25	41	497	4	10

	PHF	**Trucks**
AM	0.859	1.8%
PM	0.904	1.7%



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Turning Movement Report

Prepared For:
GHD
30 River Park Place West Ste 220
Fresno, CA 93720

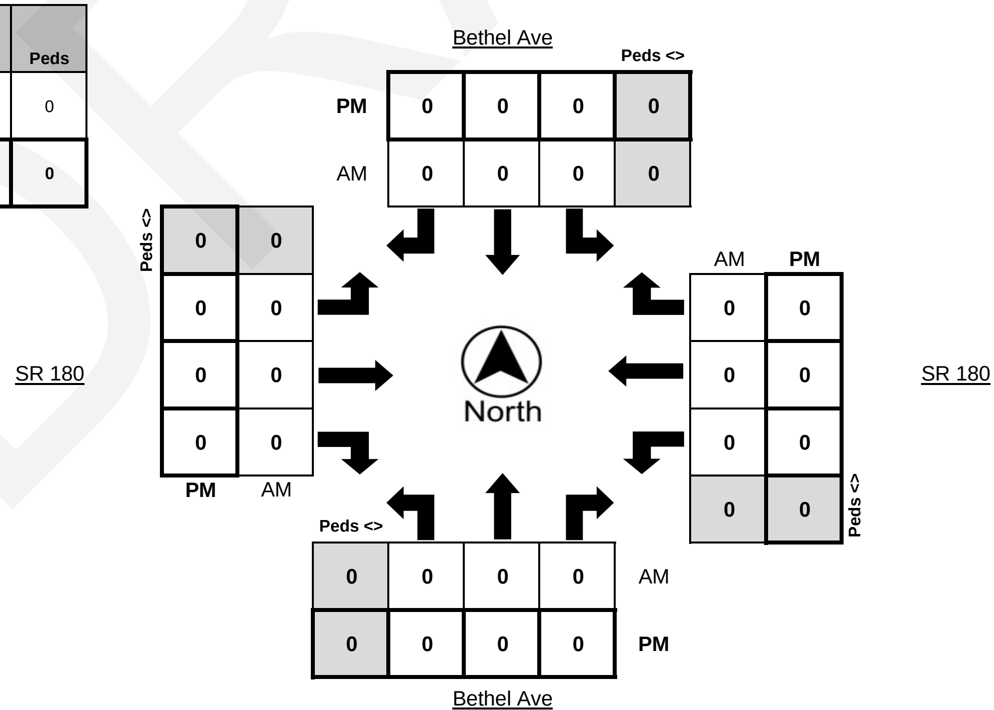
LOCATION SR 180 @ Bethel Ave
LATITUDE 36.736037°
COUNTY Fresno
LONGITUDE -119.574157°
COLLECTION DATE Wednesday, March 06, 2019
WEATHER Clear

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
7:00 AM - 7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM - 7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM - 7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM - 8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM - 8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM - 8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM - 8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM - 9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
4:00 PM - 4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM - 4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM - 4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM - 5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM - 5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM - 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM - 5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM - 6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
PEAK HOUR	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
7:00 AM - 8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM - 6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Bikes	Peds
AM Peak Total	0	0
PM Peak Total	**0**	**0**



Metro Traffic Data Inc.
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Hanford, CA 93230

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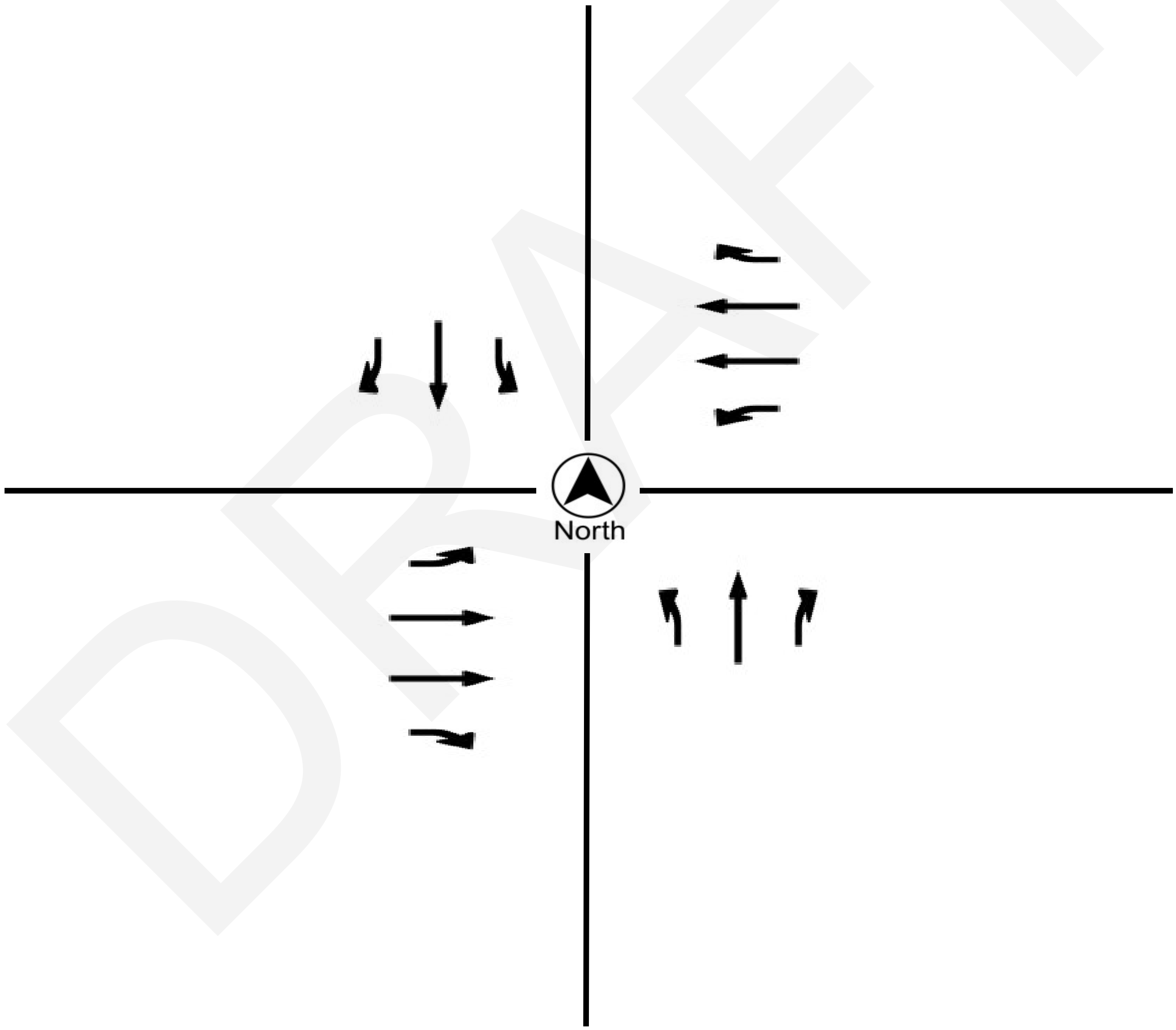
Turning Movement Report

Prepared For:
GHD
30 River Park Place West Ste 220
Fresno, CA 93720

LOCATION	SR 180 @ Bethel Ave	**N/S STREET**	Bethel Ave
COUNTY	Fresno	**E/W STREET**	SR 180
COLLECTION DATE	Wednesday, March 06, 2019	**WEATHER**	Clear
CYCLE TIME	67 Seconds	**CONTROL TYPE**	Signal

COMMENTS All approaches have protected left turns.



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Turning Movement Report

Prepared For:
GHD
30 River Park Place West Ste 220
Fresno, CA 93720

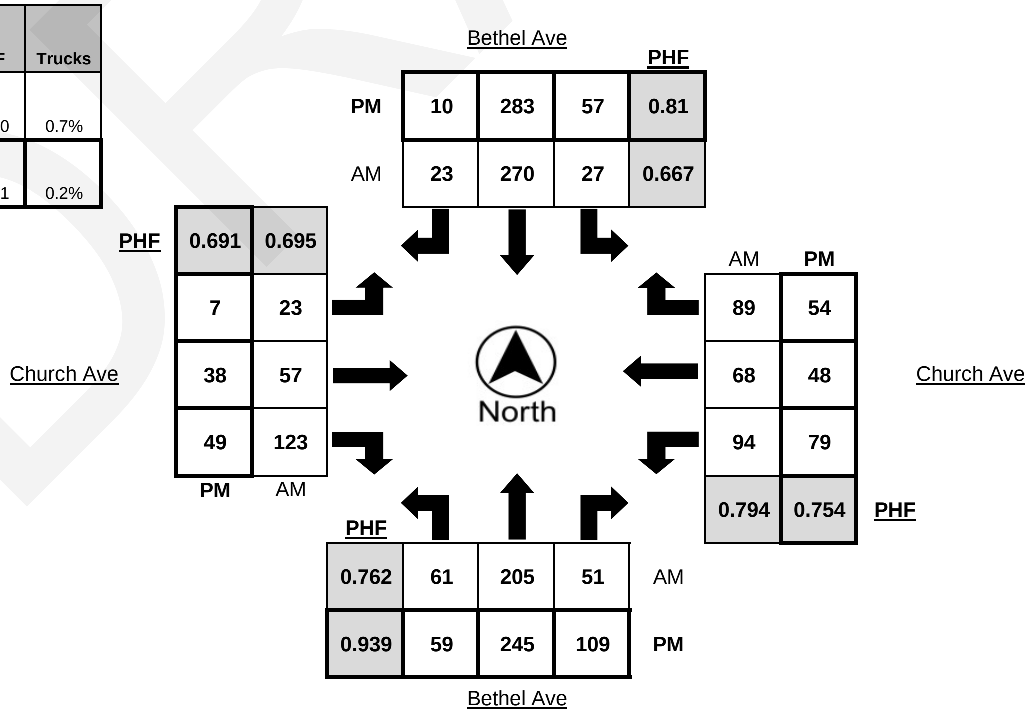
LOCATION Church Ave @ Bethel Ave
LATITUDE 36.713971°
COUNTY Fresno
LONGITUDE -119.574206°
COLLECTION DATE Tuesday, March 05, 2019
WEATHER Clear

	Northbound				Southbound				Eastbound				Westbound			
Time	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks
7:00 AM - 7:15 AM	8	39	7	0	6	53	4	1	2	13	14	1	25	7	22	1
7:15 AM - 7:30 AM	15	50	13	1	8	109	3	0	4	9	20	0	29	23	27	0
7:30 AM - 7:45 AM	17	46	18	1	5	67	9	1	3	20	45	0	24	18	23	1
7:45 AM - 8:00 AM	21	70	13	0	8	41	7	0	14	15	44	0	16	20	17	1
8:00 AM - 8:15 AM	4	47	8	2	3	52	1	0	1	5	17	0	9	3	17	1
8:15 AM - 8:30 AM	5	52	3	2	2	49	0	4	1	4	6	1	8	3	15	0
8:30 AM - 8:45 AM	4	47	7	1	4	35	0	0	1	3	10	0	9	4	9	0
8:45 AM - 9:00 AM	3	36	4	1	3	45	1	0	2	3	15	3	20	6	10	0
TOTAL	**77**	**387**	**73**	**8**	**39**	**451**	**25**	**6**	**28**	**72**	**171**	**5**	**140**	**84**	**140**	**4**

	Northbound				Southbound				Eastbound				Westbound			
Time	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks
4:00 PM - 4:15 PM	10	46	17	1	10	66	0	0	3	1	8	0	19	5	8	0
4:15 PM - 4:30 PM	5	51	25	0	15	61	1	1	0	10	9	0	18	2	10	0
4:30 PM - 4:45 PM	9	56	14	0	14	69	0	0	3	7	7	0	14	6	6	0
4:45 PM - 5:00 PM	7	78	34	0	7	78	3	0	3	10	16	0	9	10	3	0
5:00 PM - 5:15 PM	14	73	23	0	12	64	0	0	1	7	6	0	21	7	9	0
5:15 PM - 5:30 PM	11	54	26	0	18	85	5	0	3	14	10	0	19	13	15	0
5:30 PM - 5:45 PM	17	59	31	1	13	76	1	0	3	11	20	0	13	8	16	0
5:45 PM - 6:00 PM	17	59	29	1	14	58	4	0	0	6	13	0	26	20	14	0
TOTAL	**90**	**476**	**199**	**3**	**103**	**557**	**14**	**1**	**16**	**66**	**89**	**0**	**139**	**71**	**81**	**0**

	Northbound				Southbound				Eastbound				Westbound			
PEAK HOUR	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks
7:00 AM - 8:00 AM	61	205	51	2	27	270	23	2	23	57	123	1	94	68	89	3
5:00 PM - 6:00 PM	59	245	109	2	57	283	10	0	7	38	49	0	79	48	54	0

	PHF	Trucks
AM	0.880	0.7%
PM	0.951	0.2%



Turning Movement Report

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Prepared For:
GHD
30 River Park Place West Ste 220
Fresno, CA 93720

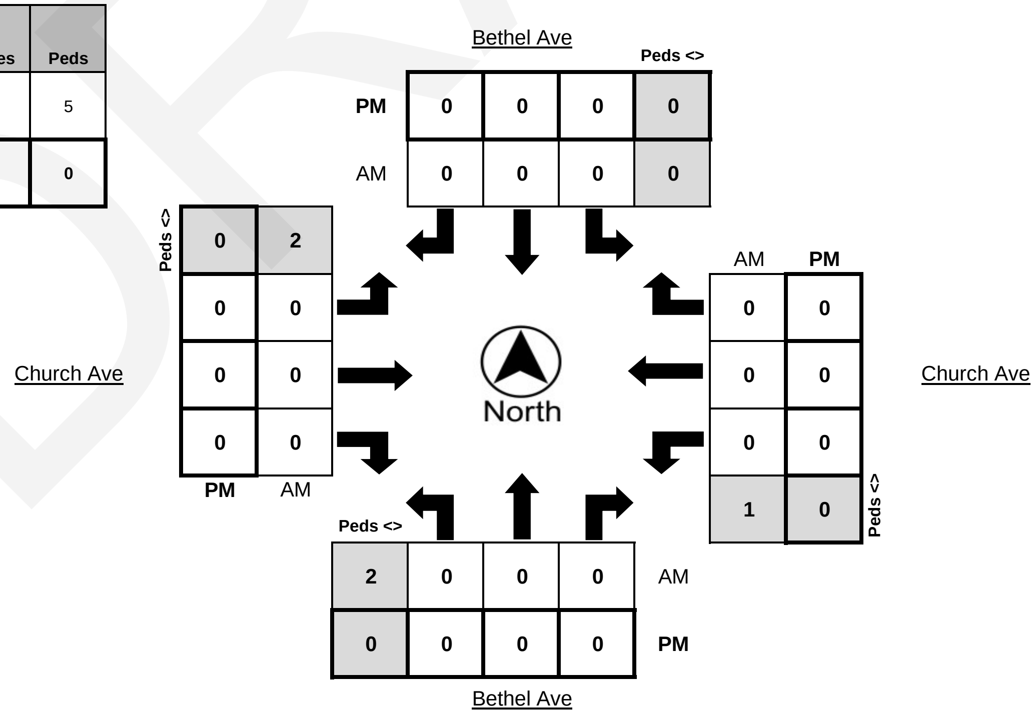
LOCATION Church Ave @ Bethel Ave
LATITUDE 36.713971°
COUNTY Fresno
LONGITUDE -119.574206°
COLLECTION DATE Tuesday, March 05, 2019
WEATHER Clear

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
7:00 AM - 7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:15 AM - 7:30 AM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0
7:30 AM - 7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM - 8:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
8:00 AM - 8:15 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
8:15 AM - 8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM - 8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM - 9:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**3**

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
4:00 PM - 4:15 PM	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
4:15 PM - 4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM - 4:45 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
4:45 PM - 5:00 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
5:00 PM - 5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM - 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM - 5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM - 6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**

	Northbound Bikes			N.Leg	Southbound Bikes			S.Leg	Eastbound Bikes			E.Leg	Westbound Bikes			W.Leg
PEAK HOUR	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
7:00 AM - 8:00 AM	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	2
5:00 PM - 6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Bikes	Peds
AM Peak Total	0	5
PM Peak Total	0	0



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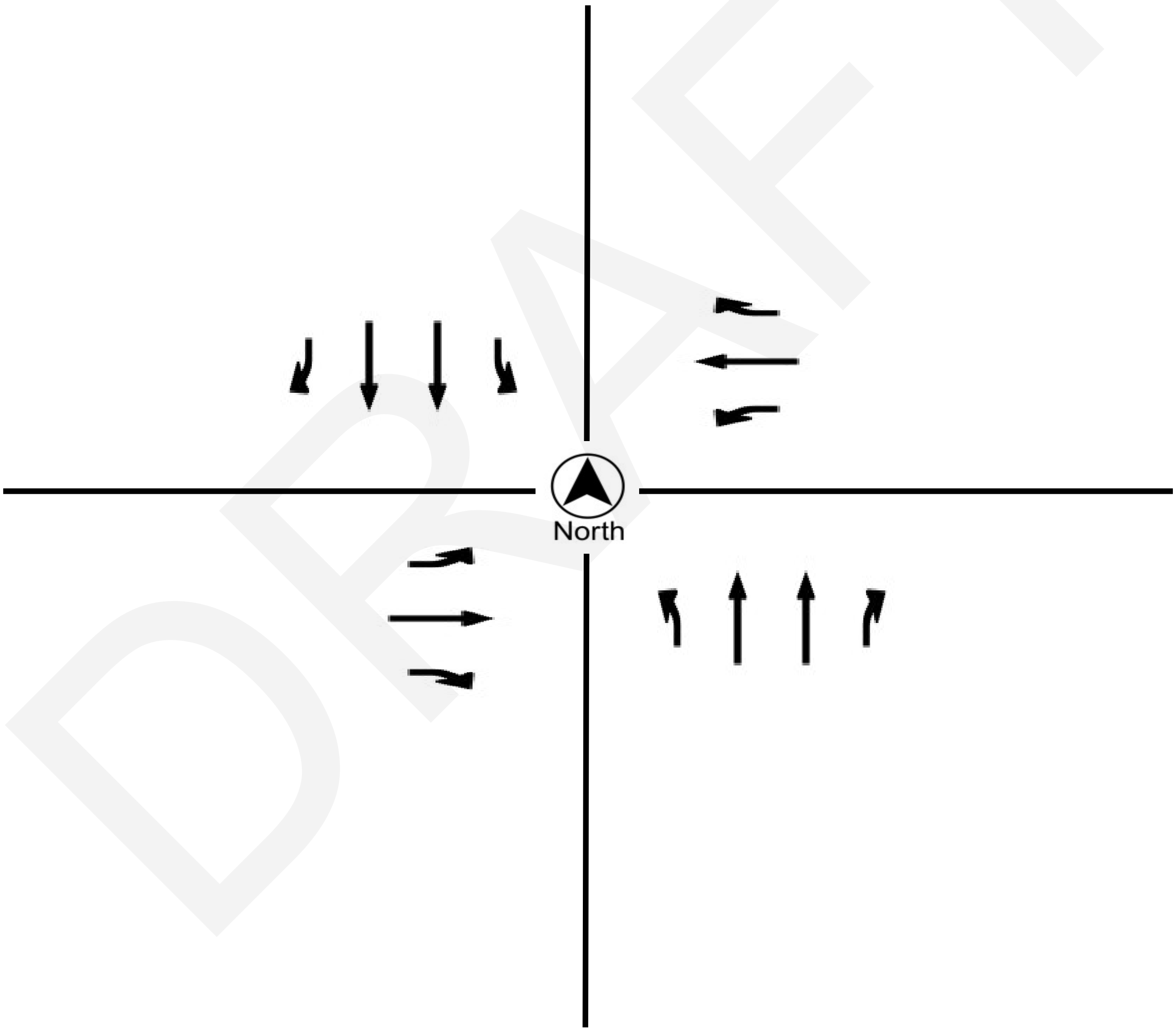
Turning Movement Report

Prepared For:
GHD
30 River Park Place West Ste 220
Fresno, CA 93720

LOCATION	Church Ave @ Bethel Ave	**N/S STREET**	Bethel Ave
COUNTY	Fresno	**E/W STREET**	Church Ave
COLLECTION DATE	Tuesday, March 05, 2019	**WEATHER**	Clear
CYCLE TIME	58 Seconds	**CONTROL TYPE**	Signal

COMMENTS All approaches have protected left turns.



Metro Traffic Data Inc.
310 N. Irwin Street - Suite 20
Hanford, CA 93230

800-975-6938 Phone/Fax
www.metrotrafficdata.com

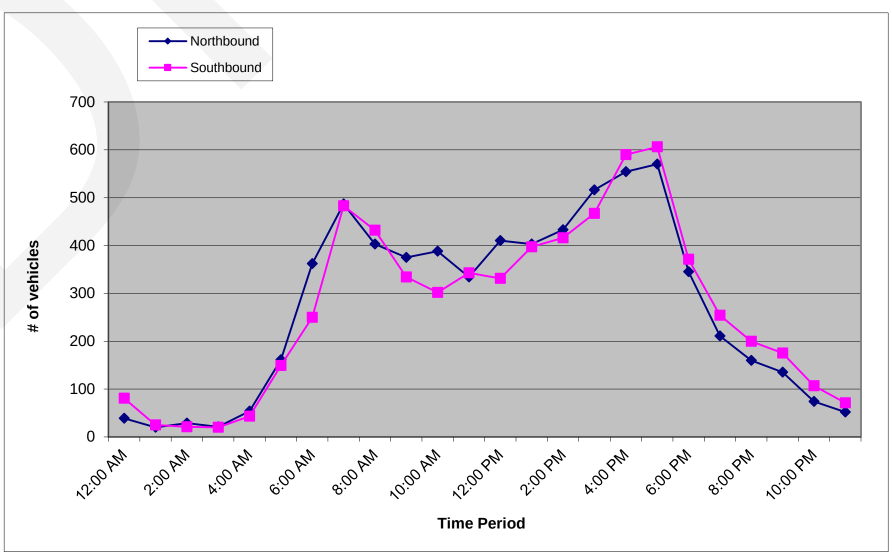
24 Hour Volume Report

Prepared For: **OMNI-MEANS, Ltd.**
943 Reserve Drive, Suite 100
Roseville, CA

LOCATION	Academy Ave s/o Kings Canyon Rd	**LATITUDE**	36.7345464
COUNTY	Fresno	**LONGITUDE**	-119.5562401
COLLECTION DATE	Thursday, January 11, 2018	**WEATHER**	Clear
NUMBER OF LANES	4		

	Northbound					Southbound					Hourly
Hour	:00	:15	:30	:45	**Total**	:00	:15	:30	:45	**Total**	**Totals**
12:00 AM	9	12	5	13	**39**	15	23	23	20	**81**	**120**
1:00 AM	8	5	2	5	**20**	5	6	7	7	**25**	**45**
2:00 AM	4	11	8	6	**29**	4	7	6	4	**21**	**50**
3:00 AM	2	2	11	6	**21**	4	7	6	3	**20**	**41**
4:00 AM	5	9	19	21	**54**	10	7	12	14	**43**	**97**
5:00 AM	16	28	62	55	**161**	17	31	47	54	**149**	**310**
6:00 AM	59	89	125	89	**362**	34	44	66	106	**250**	**612**
7:00 AM	119	124	127	117	**487**	112	119	119	133	**483**	**970**
8:00 AM	132	89	87	95	**403**	105	122	112	93	**432**	**835**
9:00 AM	87	104	100	84	**375**	85	72	89	88	**334**	**709**
10:00 AM	84	92	111	101	**388**	80	70	68	84	**302**	**690**
11:00 AM	99	84	82	69	**334**	68	76	104	95	**343**	**677**
12:00 PM	102	107	96	105	**410**	74	92	83	82	**331**	**741**
1:00 PM	109	105	90	99	**403**	104	94	94	105	**397**	**800**
2:00 PM	110	97	131	95	**433**	91	108	99	118	**416**	**849**
3:00 PM	108	131	160	117	**516**	117	98	121	131	**467**	**983**
4:00 PM	161	151	128	114	**554**	141	141	148	160	**590**	**1144**
5:00 PM	181	134	139	116	**570**	150	143	182	131	**606**	**1176**
6:00 PM	106	99	77	63	**345**	97	106	95	73	**371**	**716**
7:00 PM	56	49	54	52	**211**	71	76	60	47	**254**	**465**
8:00 PM	50	43	34	33	**160**	38	48	63	51	**200**	**360**
9:00 PM	39	40	36	20	**135**	45	55	47	28	**175**	**310**
10:00 PM	26	21	18	9	**74**	34	35	21	17	**107**	**181**
11:00 PM	11	15	12	14	**52**	13	21	18	19	**71**	**123**
Total	**50.3%**				**6536**	**49.7%**				**6468**	
	13004										

AM%	**39.6%**	**AM Peak**	**976**	**7:15 am to 8:15 am**	**AM P.H.F.**	**0.98**
PM%	**60.4%**	**PM Peak**	**1203**	**4:45 pm to 5:45 pm**	**PM P.H.F.**	**0.91**



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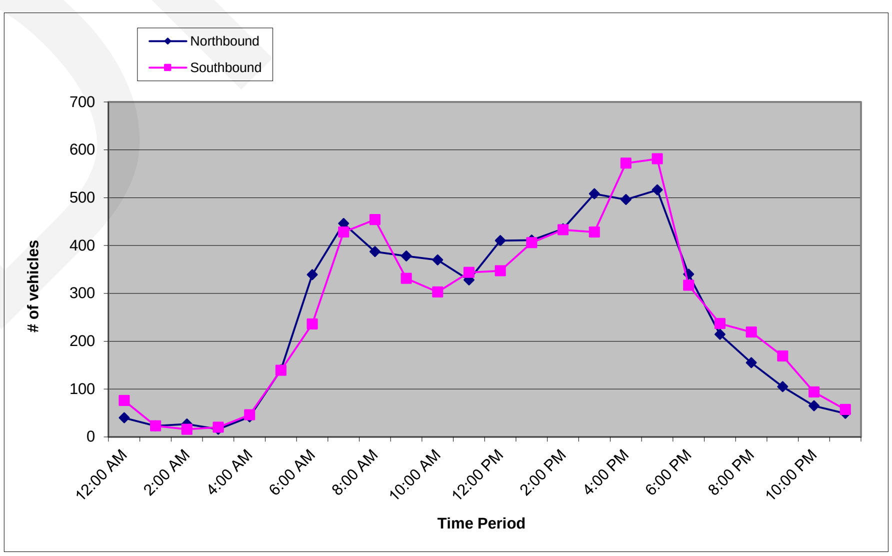
24 Hour Volume Report

Prepared For: **OMNI-MEANS, Ltd.**
943 Reserve Drive, Suite 100
Roseville, CA

LOCATION	Academy Ave n/o Church Ave	**LATITUDE**	36.7148389
COUNTY	Fresno	**LONGITUDE**	-119.5566478
COLLECTION DATE	Thursday, January 11, 2018	**WEATHER**	Clear
NUMBER OF LANES	4		

	Northbound					Southbound					Hourly
Hour	:00	:15	:30	:45	**Total**	:00	:15	:30	:45	**Total**	**Totals**
12:00 AM	12	10	5	13	**40**	14	20	26	16	**76**	**116**
1:00 AM	8	7	2	6	**23**	7	6	7	3	**23**	**46**
2:00 AM	3	8	11	5	**27**	4	6	3	3	**16**	**43**
3:00 AM	1	2	7	6	**16**	4	7	6	3	**20**	**36**
4:00 AM	5	7	16	14	**42**	11	10	10	15	**46**	**88**
5:00 AM	15	24	58	43	**140**	12	27	43	57	**139**	**279**
6:00 AM	53	80	117	89	**339**	31	38	60	107	**236**	**575**
7:00 AM	112	102	120	112	**446**	88	123	98	119	**428**	**874**
8:00 AM	105	94	81	107	**387**	110	107	114	123	**454**	**841**
9:00 AM	101	88	105	84	**378**	88	74	95	74	**331**	**709**
10:00 AM	79	89	100	102	**370**	85	74	64	80	**303**	**673**
11:00 AM	106	76	75	71	**328**	77	84	105	78	**344**	**672**
12:00 PM	105	103	96	106	**410**	75	92	88	92	**347**	**757**
1:00 PM	105	100	94	112	**411**	97	100	100	109	**406**	**817**
2:00 PM	97	107	123	108	**435**	98	114	112	109	**433**	**868**
3:00 PM	96	134	160	118	**508**	113	99	98	118	**428**	**936**
4:00 PM	148	120	126	102	**496**	138	130	148	156	**572**	**1068**
5:00 PM	159	120	138	99	**516**	141	140	162	138	**581**	**1097**
6:00 PM	99	84	79	78	**340**	90	78	81	68	**317**	**657**
7:00 PM	62	50	53	49	**214**	69	71	57	40	**237**	**451**
8:00 PM	52	40	23	40	**155**	42	46	61	70	**219**	**374**
9:00 PM	31	31	25	18	**105**	47	50	44	28	**169**	**274**
10:00 PM	22	18	17	8	**65**	30	27	20	17	**94**	**159**
11:00 PM	12	14	13	10	**49**	8	20	13	16	**57**	**106**
Total	**49.9%**				**6240**	**50.1%**				**6276**	
	12516										

AM%	**39.6%**	**AM Peak**	**889**	**7:15 am to 8:15 am**	**AM P.H.F.**	**0.96**
PM%	**60.4%**	**PM Peak**	**1118**	**4:45 pm to 5:45 pm**	**PM P.H.F.**	**0.93**



Synchro Analysis

Synchro Reports

Existing Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	59	305	177	49	505	140	246	159	40	169	208	82
Future Volume (veh/h)	59	305	177	49	505	140	246	159	40	169	208	82
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1841	1841	1841	1841	1841	1841	1841	1841	1841
Adj Flow Rate, veh/h	63	324	188	52	537	149	262	169	43	180	221	87
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	377	1399	624	456	1399	624	1014	1111	275	1124	990	378
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	744	3497	1560	874	3497	1560	2046	2777	688	2233	2475	945
Grp Volume(v), veh/h	63	324	188	52	537	149	262	105	107	180	154	154
Grp Sat Flow(s),veh/h/ln	744	1749	1560	874	1749	1560	1023	1749	1717	1116	1749	1671
Q Serve(g_s), s	3.0	2.8	3.7	1.9	4.9	2.9	4.4	1.7	1.8	2.5	2.6	2.7
Cycle Q Clear(g_c), s	7.8	2.8	3.7	4.6	4.9	2.9	7.1	1.7	1.8	4.3	2.6	2.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.40	1.00		0.57
Lane Grp Cap(c), veh/h	377	1399	624	456	1399	624	1014	699	687	1124	699	668
V/C Ratio(X)	0.17	0.23	0.30	0.11	0.38	0.24	0.26	0.15	0.16	0.16	0.22	0.23
Avail Cap(c_a), veh/h	377	1399	624	456	1399	624	1014	699	687	1124	699	668
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	12.4	8.9	9.2	10.5	9.6	9.0	11.3	8.6	8.6	10.0	8.9	8.9
Incr Delay (d2), s/veh	1.0	0.4	1.2	0.5	0.8	0.9	0.6	0.5	0.5	0.3	0.7	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.7	1.0	0.3	1.3	0.7	0.7	0.5	0.5	0.4	0.7	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.3	9.3	10.4	11.0	10.4	9.9	11.9	9.1	9.1	10.3	9.6	9.7
LnGrp LOS	B	A	B	B	B	A	B	A	A	B	A	A
Approach Vol, veh/h		575			738			474			488	
Approach Delay, s/veh		10.1			10.3			10.6			9.9	
Approach LOS		B			B			B			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		9.1		9.8		6.3		6.9				
Green Ext Time (p_c), s		1.6		1.8		1.8		2.9				
Intersection Summary												
HCM 6th Ctrl Delay			10.2									
HCM 6th LOS			B									

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	4	0	2	0	450	3	3	442	0
Future Vol, veh/h	0	0	0	4	0	2	0	450	3	3	442	0
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	-	-	-	-	-	-	140	-	-	145	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	0	0	0	4	0	2	0	474	3	3	465	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	708	948	233	715	947	239	465	0	0	477	0	0
Stage 1	471	471	-	476	476	-	-	-	-	-	-	-
Stage 2	237	477	-	239	471	-	-	-	-	-	-	-
Critical Hdwy	7.56	6.56	6.96	7.56	6.56	6.96	4.16	-	-	4.16	-	-
Critical Hdwy Stg 1	6.56	5.56	-	6.56	5.56	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.56	5.56	-	6.56	5.56	-	-	-	-	-	-	-
Follow-up Hdwy	3.53	4.03	3.33	3.53	4.03	3.33	2.23	-	-	2.23	-	-
Pot Cap-1 Maneuver	320	258	766	316	258	759	1086	-	-	1074	-	-
Stage 1	540	555	-	536	552	-	-	-	-	-	-	-
Stage 2	742	552	-	740	555	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	318	257	766	315	257	759	1086	-	-	1074	-	-
Mov Cap-2 Maneuver	318	257	-	315	257	-	-	-	-	-	-	-
Stage 1	540	553	-	536	552	-	-	-	-	-	-	-
Stage 2	740	552	-	738	553	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	14.4	0	0.1
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1086	-	-	-	391	1074	-	-
HCM Lane V/C Ratio	-	-	-	-	0.016	0.003	-	-
HCM Control Delay (s)	0	-	-	0	14.4	8.4	-	-
HCM Lane LOS	A	-	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0	0	-	-

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	26	0	34	0	416	15	30	392	0
Future Vol, veh/h	0	0	0	26	0	34	0	416	15	30	392	0
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	-	-	-	-	-	-	185	-	-	190	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	0	0	0	27	0	35	0	429	15	31	404	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	681	910	202	701	903	222	404	0	0	444	0	0
Stage 1	466	466	-	437	437	-	-	-	-	-	-	-
Stage 2	215	444	-	264	466	-	-	-	-	-	-	-
Critical Hdwy	7.56	6.56	6.96	7.56	6.56	6.96	4.16	-	-	4.16	-	-
Critical Hdwy Stg 1	6.56	5.56	-	6.56	5.56	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.56	5.56	-	6.56	5.56	-	-	-	-	-	-	-
Follow-up Hdwy	3.53	4.03	3.33	3.53	4.03	3.33	2.23	-	-	2.23	-	-
Pot Cap-1 Maneuver	335	271	802	324	274	779	1144	-	-	1105	-	0
Stage 1	543	558	-	565	575	-	-	-	-	-	-	0
Stage 2	764	571	-	715	558	-	-	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	313	263	802	317	266	779	1144	-	-	1105	-	-
Mov Cap-2 Maneuver	313	263	-	317	266	-	-	-	-	-	-	-
Stage 1	543	542	-	565	575	-	-	-	-	-	-	-
Stage 2	730	571	-	695	542	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	13.7	0	0.6
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	1144	-	-	-	477	1105	-
HCM Lane V/C Ratio	-	-	-	-	0.13	0.028	-
HCM Control Delay (s)	0	-	-	0	13.7	8.4	-
HCM Lane LOS	A	-	-	A	B	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0.4	0.1	-

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	8	425	4	3	427
Future Vol, veh/h	2	8	425	4	3	427
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	-	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	2	8	447	4	3	449

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	680	226	0	0	451	0
Stage 1	449	-	-	-	-	-
Stage 2	231	-	-	-	-	-
Critical Hdwy	6.86	6.96	-	-	4.16	-
Critical Hdwy Stg 1	5.86	-	-	-	-	-
Critical Hdwy Stg 2	5.86	-	-	-	-	-
Follow-up Hdwy	3.53	3.33	-	-	2.23	-
Pot Cap-1 Maneuver	382	774	-	-	1099	-
Stage 1	607	-	-	-	-	-
Stage 2	782	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	381	774	-	-	1099	-
Mov Cap-2 Maneuver	479	-	-	-	-	-
Stage 1	605	-	-	-	-	-
Stage 2	782	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.3	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	689	1099	-
HCM Lane V/C Ratio	-	-	0.015	0.003	-
HCM Control Delay (s)	-	-	10.3	8.3	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	0.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	23	417	10	7	425
Future Vol, veh/h	25	23	417	10	7	425
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	-	-	-	90	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	26	24	434	10	7	443

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	675	222	0	0	444	0
Stage 1	439	-	-	-	-	-
Stage 2	236	-	-	-	-	-
Critical Hdwy	6.86	6.96	-	-	4.16	-
Critical Hdwy Stg 1	5.86	-	-	-	-	-
Critical Hdwy Stg 2	5.86	-	-	-	-	-
Follow-up Hdwy	3.53	3.33	-	-	2.23	-
Pot Cap-1 Maneuver	385	779	-	-	1105	-
Stage 1	614	-	-	-	-	-
Stage 2	778	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	383	779	-	-	1105	-
Mov Cap-2 Maneuver	480	-	-	-	-	-
Stage 1	610	-	-	-	-	-
Stage 2	778	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.7	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	588	1105	-
HCM Lane V/C Ratio	-	-	0.085	0.007	-
HCM Control Delay (s)	-	-	11.7	8.3	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0	-

Intersection						
Int Delay, s/veh	3.1					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	38	146	302	39	80	364
Future Vol, veh/h	38	146	302	39	80	364
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	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	39	151	311	40	82	375

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	683	176	0	0	351	0
Stage 1	331	-	-	-	-	-
Stage 2	352	-	-	-	-	-
Critical Hdwy	6.86	6.96	-	-	4.16	-
Critical Hdwy Stg 1	5.86	-	-	-	-	-
Critical Hdwy Stg 2	5.86	-	-	-	-	-
Follow-up Hdwy	3.53	3.33	-	-	2.23	-
Pot Cap-1 Maneuver	381	834	-	-	1197	-
Stage 1	697	-	-	-	-	-
Stage 2	680	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	355	834	-	-	1197	-
Mov Cap-2 Maneuver	355	-	-	-	-	-
Stage 1	649	-	-	-	-	-
Stage 2	680	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.8	0	1.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	652	1197	-
HCM Lane V/C Ratio	-	-	0.291	0.069	-
HCM Control Delay (s)	-	-	12.8	8.2	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	1.2	0.2	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	491	107	23	870	3	343	70	17	2	54	10
Future Volume (veh/h)	9	491	107	23	870	3	343	70	17	2	54	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	10	571	124	27	1012	3	399	81	20	2	63	12
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	249	1421	634	374	1421	634	656	579	143	632	611	116
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	555	3554	1585	750	3554	1585	1325	1448	358	1294	1527	291
Grp Volume(v), veh/h	10	571	124	27	1012	3	399	0	101	2	0	75
Grp Sat Flow(s),veh/h/ln	555	1777	1585	750	1777	1585	1325	0	1806	1294	0	1818
Q Serve(g_s), s	0.7	5.2	2.3	1.2	10.8	0.1	12.1	0.0	1.6	0.0	0.0	1.2
Cycle Q Clear(g_c), s	11.4	5.2	2.3	6.4	10.8	0.1	13.3	0.0	1.6	1.6	0.0	1.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.20	1.00		0.16
Lane Grp Cap(c), veh/h	249	1421	634	374	1421	634	656	0	722	632	0	727
V/C Ratio(X)	0.04	0.40	0.20	0.07	0.71	0.00	0.61	0.00	0.14	0.00	0.00	0.10
Avail Cap(c_a), veh/h	249	1421	634	374	1421	634	656	0	722	632	0	727
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	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.1	9.7	8.8	11.9	11.3	8.1	12.6	0.0	8.6	9.1	0.0	8.4
Incr Delay (d2), s/veh	0.3	0.8	0.7	0.4	3.1	0.0	4.2	0.0	0.4	0.0	0.0	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	0.1	1.3	0.6	0.2	3.1	0.0	3.3	0.0	0.5	0.0	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.4	10.5	9.5	12.3	14.4	8.1	16.8	0.0	9.0	9.1	0.0	8.7
LnGrp LOS	B	B	A	B	B	A	B	A	A	A	A	A
Approach Vol, veh/h		705			1042			500			77	
Approach Delay, s/veh		10.4			14.3			15.2			8.7	
Approach LOS		B			B			B			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		15.3		13.4		3.6		12.8				
Green Ext Time (p_c), s		0.6		1.6		0.2		2.8				
Intersection Summary												
HCM 6th Ctrl Delay			13.1									
HCM 6th LOS			B									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	57	123	94	68	89	61	205	51	27	270	23
Future Volume (veh/h)	23	57	123	94	68	89	61	205	51	27	270	23
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	26	65	140	107	77	101	69	233	58	31	307	26
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, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	615	754	639	609	754	639	501	1433	639	553	1433	639
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.13	0.13	0.13
Sat Flow, veh/h	1216	1885	1598	1186	1885	1598	1055	3582	1598	1097	3582	1598
Grp Volume(v), veh/h	26	65	140	107	77	101	69	233	58	31	307	26
Grp Sat Flow(s),veh/h/ln	1216	1885	1598	1186	1885	1598	1055	1791	1598	1097	1791	1598
Q Serve(g_s), s	0.6	1.0	2.6	2.8	1.1	1.8	2.1	1.9	1.0	1.1	3.4	0.6
Cycle Q Clear(g_c), s	1.8	1.0	2.6	3.7	1.1	1.8	5.6	1.9	1.0	3.0	3.4	0.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	615	754	639	609	754	639	501	1433	639	553	1433	639
V/C Ratio(X)	0.04	0.09	0.22	0.18	0.10	0.16	0.14	0.16	0.09	0.06	0.21	0.04
Avail Cap(c_a), veh/h	615	754	639	609	754	639	501	1433	639	553	1433	639
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	9.0	8.4	8.9	9.6	8.4	8.6	11.0	8.7	8.4	13.9	13.2	12.0
Incr Delay (d2), s/veh	0.1	0.2	0.8	0.6	0.3	0.5	0.6	0.2	0.3	0.2	0.3	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	0.2	0.4	0.9	0.7	0.4	0.6	0.5	0.6	0.3	0.2	1.1	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.1	8.6	9.7	10.2	8.7	9.2	11.6	8.9	8.7	14.1	13.6	12.1
LnGrp LOS	A	A	A	B	A	A	B	A	A	B	B	B
Approach Vol, veh/h		231			285			360			364	
Approach Delay, s/veh		9.3			9.4			9.4			13.5	
Approach LOS		A			A			A			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		7.6		4.6		5.4		5.7				
Green Ext Time (p_c), s		1.4		0.7		1.6		0.9				

Intersection Summary		
HCM 6th Ctrl Delay		10.6
HCM 6th LOS		B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	544	251	60	466	149	224	205	98	155	208	59
Future Volume (veh/h)	60	544	251	60	466	149	224	205	98	155	208	59
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	63	573	264	63	491	157	236	216	103	163	219	62
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	398	1421	634	347	1421	634	1059	946	435	1014	1100	304
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	783	3554	1585	657	3554	1585	2130	2364	1087	2058	2750	760
Grp Volume(v), veh/h	63	573	264	63	491	157	236	160	159	163	140	141
Grp Sat Flow(s),veh/h/ln	783	1777	1585	657	1777	1585	1065	1777	1675	1029	1777	1734
Q Serve(g_s), s	2.7	5.2	5.4	3.4	4.3	3.0	3.7	2.7	2.8	2.6	2.3	2.4
Cycle Q Clear(g_c), s	7.1	5.2	5.4	8.6	4.3	3.0	6.1	2.7	2.8	5.4	2.3	2.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.65	1.00		0.44
Lane Grp Cap(c), veh/h	398	1421	634	347	1421	634	1059	711	670	1014	711	693
V/C Ratio(X)	0.16	0.40	0.42	0.18	0.35	0.25	0.22	0.23	0.24	0.16	0.20	0.20
Avail Cap(c_a), veh/h	398	1421	634	347	1421	634	1059	711	670	1014	711	693
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	11.9	9.7	9.7	12.7	9.4	9.0	10.8	8.9	8.9	10.7	8.8	8.8
Incr Delay (d2), s/veh	0.8	0.9	2.0	1.1	0.7	0.9	0.5	0.7	0.8	0.3	0.6	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	1.4	1.5	0.5	1.1	0.8	0.6	0.8	0.8	0.4	0.6	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.7	10.5	11.7	13.9	10.1	9.9	11.3	9.6	9.8	11.1	9.4	9.5
LnGrp LOS	B	B	B	B	B	A	B	A	A	B	A	A
Approach Vol, veh/h		900			711			555			444	
Approach Delay, s/veh		11.0			10.4			10.4			10.0	
Approach LOS		B			B			B			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		8.1		9.1		7.4		10.6				
Green Ext Time (p_c), s		2.0		3.1		1.6		2.3				

Intersection Summary			
HCM 6th Ctrl Delay			10.5
HCM 6th LOS			B

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	7	0	12	0	483	10	9	565	0
Future Vol, veh/h	0	0	0	7	0	12	0	483	10	9	565	0
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	-	-	-	-	-	-	140	-	-	145	-	-
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, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	0	0	0	8	0	13	0	537	11	10	628	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	917	1196	314	877	1191	274	628	0	0	548	0	0
Stage 1	648	648	-	543	543	-	-	-	-	-	-	-
Stage 2	269	548	-	334	648	-	-	-	-	-	-	-
Critical Hdwy	7.52	6.52	6.92	7.52	6.52	6.92	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.51	4.01	3.31	3.51	4.01	3.31	2.21	-	-	2.21	-	-
Pot Cap-1 Maneuver	228	186	685	244	188	727	957	-	-	1025	-	-
Stage 1	428	467	-	494	520	-	-	-	-	-	-	-
Stage 2	716	518	-	656	467	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	222	184	685	242	186	727	957	-	-	1025	-	-
Mov Cap-2 Maneuver	222	184	-	242	186	-	-	-	-	-	-	-
Stage 1	428	462	-	494	520	-	-	-	-	-	-	-
Stage 2	703	518	-	650	462	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	14.1	0	0.1
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	957	-	-	-	418	1025	-	-
HCM Lane V/C Ratio	-	-	-	-	0.051	0.01	-	-
HCM Control Delay (s)	0	-	-	0	14.1	8.5	-	-
HCM Lane LOS	A	-	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0.2	0	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	23	0	32	0	466	25	20	549	0
Future Vol, veh/h	0	0	0	23	0	32	0	466	25	20	549	0
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	-	-	-	-	-	-	185	-	-	190	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	0	0	0	25	0	35	0	512	27	22	603	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	903	1186	302	872	1173	270	603	0	0	539	0	0
Stage 1	647	647	-	526	526	-	-	-	-	-	-	-
Stage 2	256	539	-	346	647	-	-	-	-	-	-	-
Critical Hdwy	7.52	6.52	6.92	7.52	6.52	6.92	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.51	4.01	3.31	3.51	4.01	3.31	2.21	-	-	2.21	-	-
Pot Cap-1 Maneuver	234	189	697	246	192	731	977	-	-	1032	-	0
Stage 1	428	467	-	506	530	-	-	-	-	-	-	0
Stage 2	729	523	-	646	467	-	-	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	219	185	697	242	188	731	977	-	-	1032	-	-
Mov Cap-2 Maneuver	219	185	-	242	188	-	-	-	-	-	-	-
Stage 1	428	457	-	506	530	-	-	-	-	-	-	-
Stage 2	694	523	-	632	457	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	15.7	0	0.3
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	977	-	-	-	396	1032	-
HCM Lane V/C Ratio	-	-	-	-	0.153	0.021	-
HCM Control Delay (s)	0	-	-	0	15.7	8.6	-
HCM Lane LOS	A	-	-	A	C	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0.5	0.1	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	4	498	4	3	566
Future Vol, veh/h	0	4	498	4	3	566
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	-	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	0	4	547	4	3	622

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	866	276	0	0	551	0
Stage 1	549	-	-	-	-	-
Stage 2	317	-	-	-	-	-
Critical Hdwy	6.82	6.92	-	-	4.12	-
Critical Hdwy Stg 1	5.82	-	-	-	-	-
Critical Hdwy Stg 2	5.82	-	-	-	-	-
Follow-up Hdwy	3.51	3.31	-	-	2.21	-
Pot Cap-1 Maneuver	294	724	-	-	1022	-
Stage 1	545	-	-	-	-	-
Stage 2	714	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	293	724	-	-	1022	-
Mov Cap-2 Maneuver	410	-	-	-	-	-
Stage 1	543	-	-	-	-	-
Stage 2	714	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	724	1022	-
HCM Lane V/C Ratio	-	-	0.006	0.003	-
HCM Control Delay (s)	-	-	10	8.5	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	0.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	8	494	34	15	561
Future Vol, veh/h	25	8	494	34	15	561
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	-	-	-	90	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	27	9	543	37	16	616

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	902	290	0	0	580	0
Stage 1	562	-	-	-	-	-
Stage 2	340	-	-	-	-	-
Critical Hdwy	6.82	6.92	-	-	4.12	-
Critical Hdwy Stg 1	5.82	-	-	-	-	-
Critical Hdwy Stg 2	5.82	-	-	-	-	-
Follow-up Hdwy	3.51	3.31	-	-	2.21	-
Pot Cap-1 Maneuver	279	710	-	-	997	-
Stage 1	537	-	-	-	-	-
Stage 2	695	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	275	710	-	-	997	-
Mov Cap-2 Maneuver	393	-	-	-	-	-
Stage 1	528	-	-	-	-	-
Stage 2	695	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.9	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	441	997	-
HCM Lane V/C Ratio	-	-	0.082	0.017	-
HCM Control Delay (s)	-	-	13.9	8.7	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-

Intersection						
Int Delay, s/veh	2.9					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	38	76	446	76	145	447
Future Vol, veh/h	38	76	446	76	145	447
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	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	40	81	474	81	154	476

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1061	278	0	0	555	0
Stage 1	515	-	-	-	-	-
Stage 2	546	-	-	-	-	-
Critical Hdwy	6.82	6.92	-	-	4.12	-
Critical Hdwy Stg 1	5.82	-	-	-	-	-
Critical Hdwy Stg 2	5.82	-	-	-	-	-
Follow-up Hdwy	3.51	3.31	-	-	2.21	-
Pot Cap-1 Maneuver	221	722	-	-	1018	-
Stage 1	567	-	-	-	-	-
Stage 2	547	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	188	722	-	-	1018	-
Mov Cap-2 Maneuver	188	-	-	-	-	-
Stage 1	481	-	-	-	-	-
Stage 2	547	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.3	0	2.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	371	1018	-
HCM Lane V/C Ratio	-	-	0.327	0.152	-
HCM Control Delay (s)	-	-	19.3	9.2	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	1.4	0.5	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↱		↰	↱	
Traffic Volume (veh/h)	6	972	342	41	497	4	199	73	34	17	54	4
Future Volume (veh/h)	6	972	342	41	497	4	199	73	34	17	54	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	7	1080	380	46	552	4	221	81	38	19	60	4
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	407	1421	634	210	1421	634	666	482	226	614	694	46
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	853	3554	1585	364	3554	1585	1338	1204	565	1273	1734	116
Grp Volume(v), veh/h	7	1080	380	46	552	4	221	0	119	19	0	64
Grp Sat Flow(s),veh/h/ln	853	1777	1585	364	1777	1585	1338	0	1769	1273	0	1850
Q Serve(g_s), s	0.3	11.8	8.5	5.6	5.0	0.1	5.5	0.0	1.9	0.4	0.0	1.0
Cycle Q Clear(g_c), s	5.2	11.8	8.5	17.4	5.0	0.1	6.5	0.0	1.9	2.4	0.0	1.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.32	1.00		0.06
Lane Grp Cap(c), veh/h	407	1421	634	210	1421	634	666	0	707	614	0	740
V/C Ratio(X)	0.02	0.76	0.60	0.22	0.39	0.01	0.33	0.00	0.17	0.03	0.00	0.09
Avail Cap(c_a), veh/h	407	1421	634	210	1421	634	666	0	707	614	0	740
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	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	11.4	11.6	10.7	19.1	9.6	8.1	10.4	0.0	8.7	9.5	0.0	8.4
Incr Delay (d2), s/veh	0.1	3.9	4.2	2.4	0.8	0.0	1.3	0.0	0.5	0.1	0.0	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	0.0	3.5	2.5	0.5	1.3	0.0	1.4	0.0	0.6	0.1	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.5	15.5	14.8	21.5	10.4	8.1	11.7	0.0	9.2	9.5	0.0	8.6
LnGrp LOS	B	B	B	C	B	A	B	A	A	A	A	A
Approach Vol, veh/h		1467			602			340			83	
Approach Delay, s/veh		15.3			11.2			10.9			8.8	
Approach LOS		B			B			B			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		8.5		13.8		4.4		19.4				
Green Ext Time (p_c), s		0.9		2.8		0.2		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			13.5									
HCM 6th LOS			B									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↑	↱	↰	↑↑	↱
Traffic Volume (veh/h)	7	38	49	79	48	54	59	245	109	57	283	10
Future Volume (veh/h)	7	38	49	79	48	54	59	245	109	57	283	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	7	40	52	83	51	57	62	258	115	60	298	11
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, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	299	248	210	308	248	210	888	2417	1078	820	2417	1078
Arrive On Green	0.13	0.13	0.13	0.13	0.13	0.13	0.67	0.67	0.67	1.00	1.00	1.00
Sat Flow, veh/h	1306	1900	1610	1325	1900	1610	1087	3610	1610	1025	3610	1610
Grp Volume(v), veh/h	7	40	52	83	51	57	62	258	115	60	298	11
Grp Sat Flow(s),veh/h/ln	1306	1900	1610	1325	1900	1610	1087	1805	1610	1025	1805	1610
Q Serve(g_s), s	0.2	0.8	1.3	2.7	1.1	1.4	0.9	1.1	1.1	0.1	0.0	0.0
Cycle Q Clear(g_c), s	1.3	0.8	1.3	3.5	1.1	1.4	0.9	1.1	1.1	1.3	0.0	0.0
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	299	248	210	308	248	210	888	2417	1078	820	2417	1078
V/C Ratio(X)	0.02	0.16	0.25	0.27	0.21	0.27	0.07	0.11	0.11	0.07	0.12	0.01
Avail Cap(c_a), veh/h	651	760	644	665	760	644	888	2417	1078	820	2417	1078
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
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	18.1	17.4	17.6	18.9	17.5	17.6	2.6	2.6	2.6	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.6	0.5	0.4	0.7	0.2	0.1	0.2	0.2	0.1	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	0.1	0.4	0.5	0.8	0.5	0.5	0.1	0.2	0.2	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.1	17.7	18.2	19.4	17.9	18.3	2.8	2.7	2.8	0.2	0.1	0.0
LnGrp LOS	B	B	B	B	B	B	A	A	A	A	A	A
Approach Vol, veh/h		99			191			435			369	
Approach Delay, s/veh		18.0			18.7			2.8			0.1	
Approach LOS		B			B			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		34.6		10.4		34.6		10.4				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		3.1		3.3		3.3		5.5				
Green Ext Time (p_c), s		2.0		0.3		1.8		0.5				
Intersection Summary												
HCM 6th Ctrl Delay			6.0									
HCM 6th LOS			A									

Synchro Reports

Existing plus Project Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	59	305	248	60	505	140	339	191	54	169	233	82
Future Volume (veh/h)	59	305	248	60	505	140	339	191	54	169	233	82
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1841	1841	1841	1841	1841	1841	1841	1841	1841
Adj Flow Rate, veh/h	63	324	264	64	537	149	361	203	57	180	248	87
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	377	1399	624	436	1399	624	986	1085	297	1068	1023	350
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	744	3497	1560	815	3497	1560	1996	2713	743	2137	2557	875
Grp Volume(v), veh/h	63	324	264	64	537	149	361	129	131	180	168	167
Grp Sat Flow(s),veh/h/ln	744	1749	1560	815	1749	1560	998	1749	1707	1069	1749	1683
Q Serve(g_s), s	3.0	2.8	5.5	2.5	4.9	2.9	6.6	2.2	2.2	2.7	2.9	3.0
Cycle Q Clear(g_c), s	7.8	2.8	5.5	5.3	4.9	2.9	9.6	2.2	2.2	4.9	2.9	3.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.44	1.00		0.52
Lane Grp Cap(c), veh/h	377	1399	624	436	1399	624	986	699	683	1068	699	673
V/C Ratio(X)	0.17	0.23	0.42	0.15	0.38	0.24	0.37	0.18	0.19	0.17	0.24	0.25
Avail Cap(c_a), veh/h	377	1399	624	436	1399	624	986	699	683	1068	699	673
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	12.4	8.9	9.8	10.7	9.6	9.0	12.2	8.7	8.8	10.4	9.0	9.0
Incr Delay (d2), s/veh	1.0	0.4	2.1	0.7	0.8	0.9	1.1	0.6	0.6	0.3	0.8	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.7	1.5	0.4	1.3	0.7	1.1	0.6	0.6	0.5	0.8	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.3	9.3	11.8	11.4	10.4	9.9	13.2	9.3	9.4	10.7	9.8	9.9
LnGrp LOS	B	A	B	B	B	A	B	A	A	B	A	A
Approach Vol, veh/h		651			750			621			515	
Approach Delay, s/veh		10.7			10.4			11.6			10.1	
Approach LOS		B			B			B			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		11.6		9.8		6.9		7.3				
Green Ext Time (p_c), s		1.8		2.0		1.9		3.0				

Intersection Summary		
HCM 6th Ctrl Delay		10.7
HCM 6th LOS		B

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	35	1	33	4	1	3	24	486	3	4	489	27
Future Vol, veh/h	35	1	33	4	1	3	24	486	3	4	489	27
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	-	-	-	-	-	-	140	-	-	145	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	37	1	35	4	1	3	25	512	3	4	515	28

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	844	1102	272	830	1115	258	543	0	0	515	0	0
Stage 1	537	537	-	564	564	-	-	-	-	-	-	-
Stage 2	307	565	-	266	551	-	-	-	-	-	-	-
Critical Hdwy	7.56	6.56	6.96	7.56	6.56	6.96	4.16	-	-	4.16	-	-
Critical Hdwy Stg 1	6.56	5.56	-	6.56	5.56	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.56	5.56	-	6.56	5.56	-	-	-	-	-	-	-
Follow-up Hdwy	3.53	4.03	3.33	3.53	4.03	3.33	2.23	-	-	2.23	-	-
Pot Cap-1 Maneuver	255	209	723	261	205	738	1015	-	-	1040	-	-
Stage 1	493	519	-	475	504	-	-	-	-	-	-	-
Stage 2	675	504	-	714	511	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	247	203	723	242	199	738	1015	-	-	1040	-	-
Mov Cap-2 Maneuver	247	203	-	242	199	-	-	-	-	-	-	-
Stage 1	481	517	-	463	491	-	-	-	-	-	-	-
Stage 2	654	491	-	676	509	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.6	16.9	0.4	0.1
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1015	-	-	359	312	1040	-	-
HCM Lane V/C Ratio	0.025	-	-	0.202	0.027	0.004	-	-
HCM Control Delay (s)	8.6	-	-	17.6	16.9	8.5	-	-
HCM Lane LOS	A	-	-	C	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.7	0.1	0	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	0	13	26	0	35	11	472	15	32	467	5
Future Vol, veh/h	5	0	13	26	0	35	11	472	15	32	467	5
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	-	-	-	-	-	-	185	-	-	190	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	5	0	13	27	0	36	11	487	15	33	481	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	816	1074	243	824	1069	251	486	0	0	502	0	0
Stage 1	550	550	-	517	517	-	-	-	-	-	-	-
Stage 2	266	524	-	307	552	-	-	-	-	-	-	-
Critical Hdwy	7.56	6.56	6.96	7.56	6.56	6.96	4.16	-	-	4.16	-	-
Critical Hdwy Stg 1	6.56	5.56	-	6.56	5.56	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.56	5.56	-	6.56	5.56	-	-	-	-	-	-	-
Follow-up Hdwy	3.53	4.03	3.33	3.53	4.03	3.33	2.23	-	-	2.23	-	-
Pot Cap-1 Maneuver	267	217	755	263	218	746	1066	-	-	1052	-	-
Stage 1	484	512	-	507	529	-	-	-	-	-	-	-
Stage 2	714	526	-	675	511	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	246	208	755	250	209	746	1066	-	-	1052	-	-
Mov Cap-2 Maneuver	246	208	-	250	209	-	-	-	-	-	-	-
Stage 1	479	496	-	502	524	-	-	-	-	-	-	-
Stage 2	672	521	-	642	495	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.8	15.5	0.2	0.5
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1066	-	-	479	404	1052	-	-
HCM Lane V/C Ratio	0.011	-	-	0.039	0.156	0.031	-	-
HCM Control Delay (s)	8.4	-	-	12.8	15.5	8.5	-	-
HCM Lane LOS	A	-	-	B	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.5	0.1	-	-

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	10	491	4	5	513
Future Vol, veh/h	2	10	491	4	5	513
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	-	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	2	11	517	4	5	540

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	799	261	0	0	521	0
Stage 1	519	-	-	-	-	-
Stage 2	280	-	-	-	-	-
Critical Hdwy	6.86	6.96	-	-	4.16	-
Critical Hdwy Stg 1	5.86	-	-	-	-	-
Critical Hdwy Stg 2	5.86	-	-	-	-	-
Follow-up Hdwy	3.53	3.33	-	-	2.23	-
Pot Cap-1 Maneuver	321	735	-	-	1034	-
Stage 1	559	-	-	-	-	-
Stage 2	739	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	319	735	-	-	1034	-
Mov Cap-2 Maneuver	429	-	-	-	-	-
Stage 1	556	-	-	-	-	-
Stage 2	739	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	10.6		0		0.1	
HCM LOS	B					

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	657	1034	-
HCM Lane V/C Ratio	-	-	0.019	0.005	-
HCM Control Delay (s)	-	-	10.6	8.5	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	0.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	25	481	10	9	509
Future Vol, veh/h	25	25	481	10	9	509
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	-	-	-	90	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	26	26	501	10	9	530

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	789	256	0	0	511	0
Stage 1	506	-	-	-	-	-
Stage 2	283	-	-	-	-	-
Critical Hdwy	6.86	6.96	-	-	4.16	-
Critical Hdwy Stg 1	5.86	-	-	-	-	-
Critical Hdwy Stg 2	5.86	-	-	-	-	-
Follow-up Hdwy	3.53	3.33	-	-	2.23	-
Pot Cap-1 Maneuver	326	740	-	-	1043	-
Stage 1	568	-	-	-	-	-
Stage 2	737	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	323	740	-	-	1043	-
Mov Cap-2 Maneuver	433	-	-	-	-	-
Stage 1	563	-	-	-	-	-
Stage 2	737	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.3	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	546	1043	-
HCM Lane V/C Ratio	-	-	0.095	0.009	-
HCM Control Delay (s)	-	-	12.3	8.5	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0	-

Intersection	
Int Delay, s/veh	3.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	38	155	357	39	92	436
Future Vol, veh/h	38	155	357	39	92	436
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	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	39	160	368	40	95	449

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	803	204	0	0	408	0
Stage 1	388	-	-	-	-	-
Stage 2	415	-	-	-	-	-
Critical Hdwy	6.86	6.96	-	-	4.16	-
Critical Hdwy Stg 1	5.86	-	-	-	-	-
Critical Hdwy Stg 2	5.86	-	-	-	-	-
Follow-up Hdwy	3.53	3.33	-	-	2.23	-
Pot Cap-1 Maneuver	319	800	-	-	1140	-
Stage 1	652	-	-	-	-	-
Stage 2	632	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	293	800	-	-	1140	-
Mov Cap-2 Maneuver	293	-	-	-	-	-
Stage 1	598	-	-	-	-	-
Stage 2	632	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14	0	1.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	597	1140	-
HCM Lane V/C Ratio	-	-	0.333	0.083	-
HCM Control Delay (s)	-	-	14	8.4	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	1.5	0.3	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	491	159	54	870	3	459	83	90	2	59	10
Future Volume (veh/h)	9	491	159	54	870	3	459	83	90	2	59	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	10	571	185	63	1012	3	534	97	105	2	69	12
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	249	1421	634	362	1421	634	650	329	356	537	621	108
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	555	3554	1585	708	3554	1585	1317	821	889	1180	1552	270
Grp Volume(v), veh/h	10	571	185	63	1012	3	534	0	202	2	0	81
Grp Sat Flow(s),veh/h/ln	555	1777	1585	708	1777	1585	1317	0	1710	1180	0	1822
Q Serve(g_s), s	0.7	5.2	3.6	3.1	10.8	0.1	16.7	0.0	3.6	0.1	0.0	1.3
Cycle Q Clear(g_c), s	11.4	5.2	3.6	8.3	10.8	0.1	18.0	0.0	3.6	3.7	0.0	1.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.52	1.00		0.15
Lane Grp Cap(c), veh/h	249	1421	634	362	1421	634	650	0	684	537	0	729
V/C Ratio(X)	0.04	0.40	0.29	0.17	0.71	0.00	0.82	0.00	0.30	0.00	0.00	0.11
Avail Cap(c_a), veh/h	249	1421	634	362	1421	634	650	0	684	537	0	729
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	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.1	9.7	9.2	12.6	11.3	8.1	14.8	0.0	9.2	10.4	0.0	8.5
Incr Delay (d2), s/veh	0.3	0.8	1.2	1.0	3.1	0.0	11.2	0.0	1.1	0.0	0.0	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	0.1	1.3	0.9	0.4	3.1	0.0	6.1	0.0	1.2	0.0	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.4	10.5	10.3	13.7	14.4	8.1	26.0	0.0	10.3	10.4	0.0	8.8
LnGrp LOS	B	B	B	B	B	A	C	A	B	B	A	A
Approach Vol, veh/h		766			1078			736			83	
Approach Delay, s/veh		10.5			14.3			21.7			8.8	
Approach LOS		B			B			C			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		20.0		13.4		5.7		12.8				
Green Ext Time (p_c), s		0.0		1.7		0.2		2.9				
Intersection Summary												
HCM 6th Ctrl Delay			15.1									
HCM 6th LOS			B									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	57	123	111	68	112	61	225	53	34	303	23
Future Volume (veh/h)	23	57	123	111	68	112	61	225	53	34	303	23
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	26	65	140	126	77	127	69	256	60	39	344	26
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, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	605	754	639	609	754	639	480	1433	639	539	1433	639
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.13	0.13	0.13
Sat Flow, veh/h	1187	1885	1598	1186	1885	1598	1020	3582	1598	1072	3582	1598
Grp Volume(v), veh/h	26	65	140	126	77	127	69	256	60	39	344	26
Grp Sat Flow(s),veh/h/ln	1187	1885	1598	1186	1885	1598	1020	1791	1598	1072	1791	1598
Q Serve(g_s), s	0.6	1.0	2.6	3.3	1.1	2.3	2.2	2.1	1.1	1.5	3.9	0.6
Cycle Q Clear(g_c), s	1.8	1.0	2.6	4.3	1.1	2.3	6.1	2.1	1.1	3.5	3.9	0.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	605	754	639	609	754	639	480	1433	639	539	1433	639
V/C Ratio(X)	0.04	0.09	0.22	0.21	0.10	0.20	0.14	0.18	0.09	0.07	0.24	0.04
Avail Cap(c_a), veh/h	605	754	639	609	754	639	480	1433	639	539	1433	639
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	9.0	8.4	8.9	9.7	8.4	8.8	11.4	8.7	8.4	14.2	13.4	12.0
Incr Delay (d2), s/veh	0.1	0.2	0.8	0.8	0.3	0.7	0.6	0.3	0.3	0.3	0.4	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	0.2	0.4	0.9	0.8	0.4	0.8	0.5	0.7	0.3	0.3	1.3	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.1	8.6	9.7	10.5	8.7	9.5	12.0	9.0	8.7	14.4	13.8	12.1
LnGrp LOS	A	A	A	B	A	A	B	A	A	B	B	B
Approach Vol, veh/h		231			330			385			409	
Approach Delay, s/veh		9.3			9.7			9.5			13.8	
Approach LOS		A			A			A			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		8.1		4.6		5.9		6.3				
Green Ext Time (p_c), s		1.5		0.7		1.8		1.0				
Intersection Summary												
HCM 6th Ctrl Delay			10.8									
HCM 6th LOS			B									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	544	479	94	466	149	440	280	130	155	288	59
Future Volume (veh/h)	60	544	479	94	466	149	440	280	130	155	288	59
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	63	573	504	99	491	157	463	295	137	163	303	62
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	398	1421	634	309	1421	634	971	950	431	900	1178	238
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	783	3554	1585	524	3554	1585	1973	2376	1077	1855	2946	595
Grp Volume(v), veh/h	63	573	504	99	491	157	463	219	213	163	181	184
Grp Sat Flow(s),veh/h/ln	783	1777	1585	524	1777	1585	986	1777	1676	927	1777	1763
Q Serve(g_s), s	2.7	5.2	12.6	7.5	4.3	3.0	9.2	3.8	3.9	3.0	3.1	3.1
Cycle Q Clear(g_c), s	7.1	5.2	12.6	12.7	4.3	3.0	12.4	3.8	3.9	6.9	3.1	3.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.64	1.00		0.34
Lane Grp Cap(c), veh/h	398	1421	634	309	1421	634	971	711	671	900	711	705
V/C Ratio(X)	0.16	0.40	0.79	0.32	0.35	0.25	0.48	0.31	0.32	0.18	0.25	0.26
Avail Cap(c_a), veh/h	398	1421	634	309	1421	634	971	711	671	900	711	705
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	11.9	9.7	11.9	14.2	9.4	9.0	13.2	9.2	9.3	11.7	9.0	9.0
Incr Delay (d2), s/veh	0.8	0.9	9.9	2.7	0.7	0.9	1.7	1.1	1.2	0.4	0.9	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	1.4	4.3	0.8	1.1	0.8	1.6	1.1	1.1	0.5	0.9	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.7	10.5	21.8	16.9	10.1	9.9	14.9	10.4	10.5	12.1	9.9	9.9
LnGrp LOS	B	B	C	B	B	A	B	B	B	B	A	A
Approach Vol, veh/h		1140			747			895			528	
Approach Delay, s/veh		15.6			10.9			12.7			10.6	
Approach LOS		B			B			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		14.4		14.6		8.9		14.7				
Green Ext Time (p_c), s		1.7		1.8		1.9		1.4				
Intersection Summary												
HCM 6th Ctrl Delay			13.0									
HCM 6th LOS			B									

Intersection	
Int Delay, s/veh	15.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	81	2	71	8	3	14	76	605	11	11	681	85
Future Vol, veh/h	81	2	71	8	3	14	76	605	11	11	681	85
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	-	-	-	-	-	-	140	-	-	145	-	-
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, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	90	2	79	9	3	16	84	672	12	12	757	94

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1334	1680	426	1250	1721	342	851	0	0	684	0	0
Stage 1	828	828	-	846	846	-	-	-	-	-	-	-
Stage 2	506	852	-	404	875	-	-	-	-	-	-	-
Critical Hdwy	7.52	6.52	6.92	7.52	6.52	6.92	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.51	4.01	3.31	3.51	4.01	3.31	2.21	-	-	2.21	-	-
Pot Cap-1 Maneuver	113	95	580	130	89	657	790	-	-	912	-	-
Stage 1	334	386	-	325	379	-	-	-	-	-	-	-
Stage 2	520	376	-	597	367	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	97	84	580	100	78	657	790	-	-	912	-	-
Mov Cap-2 Maneuver	97	84	-	100	78	-	-	-	-	-	-	-
Stage 1	299	381	-	291	339	-	-	-	-	-	-	-
Stage 2	449	336	-	506	362	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	156.1	28.8	1.1	0.1
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	790	-	-	157	179	912	-	-
HCM Lane V/C Ratio	0.107	-	-	1.09	0.155	0.013	-	-
HCM Control Delay (s)	10.1	-	-	156.1	28.8	9	-	-
HCM Lane LOS	B	-	-	F	D	A	-	-
HCM 95th %tile Q(veh)	0.4	-	-	8.9	0.5	0	-	-

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	1	35	23	1	37	36	646	25	24	718	17
Future Vol, veh/h	17	1	35	23	1	37	36	646	25	24	718	17
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	-	-	-	-	-	-	185	-	-	190	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	19	1	38	25	1	41	40	710	27	26	789	19

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1287	1668	404	1251	1664	369	808	0	0	737	0	0
Stage 1	851	851	-	804	804	-	-	-	-	-	-	-
Stage 2	436	817	-	447	860	-	-	-	-	-	-	-
Critical Hdwy	7.52	6.52	6.92	7.52	6.52	6.92	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.51	4.01	3.31	3.51	4.01	3.31	2.21	-	-	2.21	-	-
Pot Cap-1 Maneuver	122	96	599	130	97	631	820	-	-	871	-	-
Stage 1	323	377	-	345	396	-	-	-	-	-	-	-
Stage 2	572	391	-	563	373	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	106	89	599	113	89	631	820	-	-	871	-	-
Mov Cap-2 Maneuver	106	89	-	113	89	-	-	-	-	-	-	-
Stage 1	307	366	-	328	377	-	-	-	-	-	-	-
Stage 2	508	372	-	510	362	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	25.9	27.9	0.5	0.3
HCM LOS	D	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	820	-	-	230	223	871	-	-
HCM Lane V/C Ratio	0.048	-	-	0.253	0.301	0.03	-	-
HCM Control Delay (s)	9.6	-	-	25.9	27.9	9.3	-	-
HCM Lane LOS	A	-	-	D	D	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	1	1.2	0.1	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	10	709	4	8	765
Future Vol, veh/h	0	10	709	4	8	765
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	-	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	0	11	779	4	9	841

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1220	392	0	0	783	0
Stage 1	781	-	-	-	-	-
Stage 2	439	-	-	-	-	-
Critical Hdwy	6.82	6.92	-	-	4.12	-
Critical Hdwy Stg 1	5.82	-	-	-	-	-
Critical Hdwy Stg 2	5.82	-	-	-	-	-
Follow-up Hdwy	3.51	3.31	-	-	2.21	-
Pot Cap-1 Maneuver	174	610	-	-	837	-
Stage 1	415	-	-	-	-	-
Stage 2	620	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	172	610	-	-	837	-
Mov Cap-2 Maneuver	298	-	-	-	-	-
Stage 1	410	-	-	-	-	-
Stage 2	620	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	610	837	-
HCM Lane V/C Ratio	-	-	0.018	0.011	-
HCM Control Delay (s)	-	-	11	9.3	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection						
Int Delay, s/veh	0.5					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	14	699	34	20	755
Future Vol, veh/h	25	14	699	34	20	755
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	-	-	-	90	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	27	15	768	37	22	830

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1246	403	0	0	805	0
Stage 1	787	-	-	-	-	-
Stage 2	459	-	-	-	-	-
Critical Hdwy	6.82	6.92	-	-	4.12	-
Critical Hdwy Stg 1	5.82	-	-	-	-	-
Critical Hdwy Stg 2	5.82	-	-	-	-	-
Follow-up Hdwy	3.51	3.31	-	-	2.21	-
Pot Cap-1 Maneuver	167	600	-	-	822	-
Stage 1	412	-	-	-	-	-
Stage 2	606	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	162	600	-	-	822	-
Mov Cap-2 Maneuver	287	-	-	-	-	-
Stage 1	401	-	-	-	-	-
Stage 2	606	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.6	0	0.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	353	822	-
HCM Lane V/C Ratio	-	-	0.121	0.027	-
HCM Control Delay (s)	-	-	16.6	9.5	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0.1	-

Intersection	
Int Delay, s/veh	4.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	38	104	622	76	172	614
Future Vol, veh/h	38	104	622	76	172	614
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	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	40	111	662	81	183	653

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1396	372	0	0	743	0
Stage 1	703	-	-	-	-	-
Stage 2	693	-	-	-	-	-
Critical Hdwy	6.82	6.92	-	-	4.12	-
Critical Hdwy Stg 1	5.82	-	-	-	-	-
Critical Hdwy Stg 2	5.82	-	-	-	-	-
Follow-up Hdwy	3.51	3.31	-	-	2.21	-
Pot Cap-1 Maneuver	133	628	-	-	867	-
Stage 1	455	-	-	-	-	-
Stage 2	460	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	105	628	-	-	867	-
Mov Cap-2 Maneuver	105	-	-	-	-	-
Stage 1	359	-	-	-	-	-
Stage 2	460	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	34.2		0		2.2	
HCM LOS	D					

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	269	867	-
HCM Lane V/C Ratio	-	-	0.562	0.211	-
HCM Control Delay (s)	-	-	34.2	10.3	-
HCM Lane LOS	-	-	D	B	-
HCM 95th %tile Q(veh)	-	-	3.2	0.8	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↑↱		↰	↑↱	
Traffic Volume (veh/h)	6	972	512	142	497	4	320	86	111	17	71	4
Future Volume (veh/h)	6	972	512	142	497	4	320	86	111	17	71	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	7	1080	569	158	552	4	356	96	123	19	79	4
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	407	1421	634	202	1421	634	649	298	382	522	706	36
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	853	3554	1585	303	3554	1585	1315	745	954	1162	1765	89
Grp Volume(v), veh/h	7	1080	569	158	552	4	356	0	219	19	0	83
Grp Sat Flow(s),veh/h/ln	853	1777	1585	303	1777	1585	1315	0	1699	1162	0	1854
Q Serve(g_s), s	0.3	11.8	15.1	6.2	5.0	0.1	10.5	0.0	4.0	0.5	0.0	1.3
Cycle Q Clear(g_c), s	5.2	11.8	15.1	18.0	5.0	0.1	11.8	0.0	4.0	4.5	0.0	1.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.56	1.00		0.05
Lane Grp Cap(c), veh/h	407	1421	634	202	1421	634	649	0	679	522	0	742
V/C Ratio(X)	0.02	0.76	0.90	0.78	0.39	0.01	0.55	0.00	0.32	0.04	0.00	0.11
Avail Cap(c_a), veh/h	407	1421	634	202	1421	634	649	0	679	522	0	742
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	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	11.4	11.6	12.6	21.7	9.6	8.1	12.2	0.0	9.3	10.9	0.0	8.5
Incr Delay (d2), s/veh	0.1	3.9	17.9	25.5	0.8	0.0	3.3	0.0	1.3	0.1	0.0	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	0.0	3.5	6.3	2.8	1.3	0.0	2.8	0.0	1.3	0.1	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.5	15.5	30.5	47.2	10.4	8.1	15.5	0.0	10.6	11.0	0.0	8.8
LnGrp LOS	B	B	C	D	B	A	B	A	B	B	A	A
Approach Vol, veh/h		1656			714			575			102	
Approach Delay, s/veh		20.7			18.5			13.6			9.2	
Approach LOS		C			B			B			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		13.8		17.1		6.5		20.0				
Green Ext Time (p_c), s		1.0		0.7		0.3		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			18.4									
HCM 6th LOS			B									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↑	↱	↰	↑↑	↱
Traffic Volume (veh/h)	7	38	49	89	48	67	59	309	115	79	326	10
Future Volume (veh/h)	7	38	49	89	48	67	59	309	115	79	326	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	7	40	52	94	51	71	62	325	121	83	343	11
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, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	310	267	226	321	267	226	848	2381	1062	760	2381	1062
Arrive On Green	0.14	0.14	0.14	0.14	0.14	0.14	0.66	0.66	0.66	1.00	1.00	1.00
Sat Flow, veh/h	1289	1900	1610	1325	1900	1610	1043	3610	1610	959	3610	1610
Grp Volume(v), veh/h	7	40	52	94	51	71	62	325	121	83	343	11
Grp Sat Flow(s),veh/h/ln	1289	1900	1610	1325	1900	1610	1043	1805	1610	959	1805	1610
Q Serve(g_s), s	0.2	0.8	1.3	3.0	1.1	1.8	1.0	1.5	1.2	0.2	0.0	0.0
Cycle Q Clear(g_c), s	1.3	0.8	1.3	3.8	1.1	1.8	1.0	1.5	1.2	1.7	0.0	0.0
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	310	267	226	321	267	226	848	2381	1062	760	2381	1062
V/C Ratio(X)	0.02	0.15	0.23	0.29	0.19	0.31	0.07	0.14	0.11	0.11	0.14	0.01
Avail Cap(c_a), veh/h	645	760	644	666	760	644	848	2381	1062	760	2381	1062
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
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	17.7	17.0	17.2	18.7	17.1	17.4	2.8	2.9	2.8	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.5	0.5	0.3	0.8	0.2	0.1	0.2	0.3	0.1	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	0.1	0.3	0.5	0.9	0.4	0.6	0.1	0.3	0.2	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.7	17.2	17.7	19.2	17.4	18.2	2.9	3.0	3.0	0.3	0.1	0.0
LnGrp LOS	B	B	B	B	B	B	A	A	A	A	A	A
Approach Vol, veh/h		99			216			508			437	
Approach Delay, s/veh		17.5			18.4			3.0			0.2	
Approach LOS		B			B			A			A	

Timer - Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		34.2		10.8		34.2		10.8
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0
Max Q Clear Time (g_c+I1), s		3.5		3.3		3.7		5.8
Green Ext Time (p_c), s		2.4		0.3		2.1		0.6

Intersection Summary		
HCM 6th Ctrl Delay		5.8
HCM 6th LOS		A

Synchro Reports
Cumulative No Project Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	82	425	246	81	830	230	375	242	61	358	441	174
Future Volume (veh/h)	82	425	246	81	830	230	375	242	61	358	441	174
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1841	1841	1841	1841	1841	1841	1841	1841	1841
Adj Flow Rate, veh/h	89	462	267	88	902	250	408	263	66	389	479	189
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	252	1399	624	381	1399	624	692	1112	274	994	982	385
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	480	3497	1560	715	3497	1560	1468	2781	685	2007	2454	962
Grp Volume(v), veh/h	89	462	267	88	902	250	408	164	165	389	340	328
Grp Sat Flow(s),veh/h/ln	480	1749	1560	715	1749	1560	734	1749	1717	1003	1749	1668
Q Serve(g_s), s	8.3	4.1	5.6	4.4	9.4	5.2	11.4	2.8	2.9	7.2	6.5	6.6
Cycle Q Clear(g_c), s	17.7	4.1	5.6	8.5	9.4	5.2	18.0	2.8	2.9	10.1	6.5	6.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.40	1.00		0.58
Lane Grp Cap(c), veh/h	252	1399	624	381	1399	624	692	699	687	994	699	667
V/C Ratio(X)	0.35	0.33	0.43	0.23	0.64	0.40	0.59	0.23	0.24	0.39	0.49	0.49
Avail Cap(c_a), veh/h	252	1399	624	381	1399	624	692	699	687	994	699	667
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	18.1	9.3	9.8	12.3	10.9	9.6	17.3	8.9	9.0	12.3	10.1	10.1
Incr Delay (d2), s/veh	3.9	0.6	2.1	1.4	2.3	1.9	3.7	0.8	0.8	1.2	2.4	2.6
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	0.9	1.0	1.5	0.6	2.6	1.4	1.9	0.8	0.8	1.2	1.9	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.9	10.0	11.9	13.7	13.2	11.6	21.0	9.7	9.8	13.5	12.5	12.7
LnGrp LOS	C	A	B	B	B	B	C	A	A	B	B	B
Approach Vol, veh/h		818			1240			737			1057	
Approach Delay, s/veh		11.9			12.9			16.0			12.9	
Approach LOS		B			B			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		20.0		19.7		12.1		11.4				
Green Ext Time (p_c), s		0.0		0.0		2.9		3.6				
Intersection Summary												
HCM 6th Ctrl Delay			13.3									
HCM 6th LOS			B									

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	6	17	7	13	3	11	655	4	6	782	10
Future Vol, veh/h	10	6	17	7	13	3	11	655	4	6	782	10
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	-	-	-	-	-	-	140	-	-	145	-	-
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	11	7	18	8	14	3	12	712	4	7	850	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1257	1610	431	1181	1613	358	861	0	0	716	0	0
Stage 1	870	870	-	738	738	-	-	-	-	-	-	-
Stage 2	387	740	-	443	875	-	-	-	-	-	-	-
Critical Hdwy	7.56	6.56	6.96	7.56	6.56	6.96	4.16	-	-	4.16	-	-
Critical Hdwy Stg 1	6.56	5.56	-	6.56	5.56	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.56	5.56	-	6.56	5.56	-	-	-	-	-	-	-
Follow-up Hdwy	3.53	4.03	3.33	3.53	4.03	3.33	2.23	-	-	2.23	-	-
Pot Cap-1 Maneuver	127	103	570	144	102	636	770	-	-	874	-	-
Stage 1	311	365	-	373	420	-	-	-	-	-	-	-
Stage 2	605	419	-	561	363	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	111	101	570	130	100	636	770	-	-	874	-	-
Mov Cap-2 Maneuver	111	101	-	130	100	-	-	-	-	-	-	-
Stage 1	306	362	-	367	413	-	-	-	-	-	-	-
Stage 2	572	412	-	529	360	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	29.2	42	0.2	0.1
HCM LOS	D	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	770	-	-	184	122	874	-	-
HCM Lane V/C Ratio	0.016	-	-	0.195	0.205	0.007	-	-
HCM Control Delay (s)	9.7	-	-	29.2	42	9.2	-	-
HCM Lane LOS	A	-	-	D	E	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.7	0.7	0	-	-

Intersection	
Int Delay, s/veh	45.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	49	20	82	43	62	56	61	603	22	65	744	35
Future Vol, veh/h	49	20	82	43	62	56	61	603	22	65	744	35
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	-	-	-	-	-	-	185	-	-	190	-	-
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	53	22	89	47	67	61	66	655	24	71	809	38

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1463	1781	424	1357	1788	340	847	0	0	679	0	0
Stage 1	970	970	-	799	799	-	-	-	-	-	-	-
Stage 2	493	811	-	558	989	-	-	-	-	-	-	-
Critical Hdwy	7.56	6.56	6.96	7.56	6.56	6.96	4.16	-	-	4.16	-	-
Critical Hdwy Stg 1	6.56	5.56	-	6.56	5.56	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.56	5.56	-	6.56	5.56	-	-	-	-	-	-	-
Follow-up Hdwy	3.53	4.03	3.33	3.53	4.03	3.33	2.23	-	-	2.23	-	-
Pot Cap-1 Maneuver	89	80	576	107	80	653	780	-	-	902	-	-
Stage 1	270	327	-	343	393	-	-	-	-	-	-	-
Stage 2	524	388	-	479	321	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	67	576	60	~ 67	653	780	-	-	902	-	-
Mov Cap-2 Maneuver	-	67	-	60	~ 67	-	-	-	-	-	-	-
Stage 1	247	301	-	314	360	-	-	-	-	-	-	-
Stage 2	354	355	-	346	296	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s		$ 510.7	0.9	0.7
HCM LOS	-	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	780	-	-	-	93	902	-	-
HCM Lane V/C Ratio	0.085	-	-	-	1.882	0.078	-	-
HCM Control Delay (s)	10	-	-	-	$ 510.7	9.3	-	-
HCM Lane LOS	B	-	-	-	F	A	-	-
HCM 95th %tile Q(veh)	0.3	-	-	-	14.7	0.3	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	13	616	6	6	801
Future Vol, veh/h	2	13	616	6	6	801
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	-	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	2	14	670	7	7	871

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1124	339	0	0	677	0
Stage 1	674	-	-	-	-	-
Stage 2	450	-	-	-	-	-
Critical Hdwy	6.86	6.96	-	-	4.16	-
Critical Hdwy Stg 1	5.86	-	-	-	-	-
Critical Hdwy Stg 2	5.86	-	-	-	-	-
Follow-up Hdwy	3.53	3.33	-	-	2.23	-
Pot Cap-1 Maneuver	198	654	-	-	904	-
Stage 1	465	-	-	-	-	-
Stage 2	606	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	196	654	-	-	904	-
Mov Cap-2 Maneuver	325	-	-	-	-	-
Stage 1	461	-	-	-	-	-
Stage 2	606	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.4	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	576	904	-
HCM Lane V/C Ratio	-	-	0.028	0.007	-
HCM Control Delay (s)	-	-	11.4	9	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	0.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	38	564	14	15	808
Future Vol, veh/h	25	38	564	14	15	808
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	-	-	-	90	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	27	41	613	15	16	878

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1092	314	0	0	628	0
Stage 1	621	-	-	-	-	-
Stage 2	471	-	-	-	-	-
Critical Hdwy	6.86	6.96	-	-	4.16	-
Critical Hdwy Stg 1	5.86	-	-	-	-	-
Critical Hdwy Stg 2	5.86	-	-	-	-	-
Follow-up Hdwy	3.53	3.33	-	-	2.23	-
Pot Cap-1 Maneuver	207	679	-	-	943	-
Stage 1	496	-	-	-	-	-
Stage 2	592	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	203	679	-	-	943	-
Mov Cap-2 Maneuver	333	-	-	-	-	-
Stage 1	488	-	-	-	-	-
Stage 2	592	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.7	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	481	943	-
HCM Lane V/C Ratio	-	-	0.142	0.017	-
HCM Control Delay (s)	-	-	13.7	8.9	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.5	0.1	-

Intersection	
Int Delay, s/veh	9.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	68	260	336	54	176	697
Future Vol, veh/h	68	260	336	54	176	697
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	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	74	283	365	59	191	758

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1156	212	0	0	424	0
Stage 1	395	-	-	-	-	-
Stage 2	761	-	-	-	-	-
Critical Hdwy	6.86	6.96	-	-	4.16	-
Critical Hdwy Stg 1	5.86	-	-	-	-	-
Critical Hdwy Stg 2	5.86	-	-	-	-	-
Follow-up Hdwy	3.53	3.33	-	-	2.23	-
Pot Cap-1 Maneuver	188	790	-	-	1125	-
Stage 1	647	-	-	-	-	-
Stage 2	419	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	156	790	-	-	1125	-
Mov Cap-2 Maneuver	156	-	-	-	-	-
Stage 1	537	-	-	-	-	-
Stage 2	419	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	43.1	0	1.8
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	429	1125	-
HCM Lane V/C Ratio	-	-	0.831	0.17	-
HCM Control Delay (s)	-	-	43.1	8.9	-
HCM Lane LOS	-	-	E	A	-
HCM 95th %tile Q(veh)	-	-	7.9	0.6	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	684	149	29	1085	4	596	122	30	3	94	17
Future Volume (veh/h)	13	684	149	29	1085	4	596	122	30	3	94	17
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	14	743	162	32	1179	4	648	133	33	3	102	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	208	1421	634	309	1421	634	615	579	144	574	619	109
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	474	3554	1585	616	3554	1585	1272	1447	359	1220	1548	273
Grp Volume(v), veh/h	14	743	162	32	1179	4	648	0	166	3	0	120
Grp Sat Flow(s),veh/h/ln	474	1777	1585	616	1777	1585	1272	0	1806	1220	0	1821
Q Serve(g_s), s	1.2	7.1	3.1	1.9	13.4	0.1	16.1	0.0	2.7	0.1	0.0	1.9
Cycle Q Clear(g_c), s	14.6	7.1	3.1	9.0	13.4	0.1	18.0	0.0	2.7	2.8	0.0	1.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.20	1.00		0.15
Lane Grp Cap(c), veh/h	208	1421	634	309	1421	634	615	0	722	574	0	728
V/C Ratio(X)	0.07	0.52	0.26	0.10	0.83	0.01	1.05	0.00	0.23	0.01	0.00	0.16
Avail Cap(c_a), veh/h	208	1421	634	309	1421	634	615	0	722	574	0	728
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	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.7	10.2	9.0	13.7	12.1	8.1	16.5	0.0	8.9	9.8	0.0	8.7
Incr Delay (d2), s/veh	0.6	1.4	1.0	0.7	5.7	0.0	51.3	0.0	0.7	0.0	0.0	0.5
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	0.1	1.9	0.8	0.2	4.2	0.0	14.4	0.0	0.9	0.0	0.0	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.3	11.6	10.0	14.3	17.9	8.1	67.9	0.0	9.7	9.9	0.0	9.2
LnGrp LOS	B	B	A	B	B	A	F	A	A	A	A	A
Approach Vol, veh/h		919			1215			814			123	
Approach Delay, s/veh		11.4			17.7			56.0			9.2	
Approach LOS		B			B			E			A	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	22.5	22.5	22.5	22.5
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	18.0	18.0	18.0	18.0
Max Q Clear Time (g_c+I1), s	20.0	16.6	4.8	15.4
Green Ext Time (p_c), s	0.0	0.7	0.4	1.7

Intersection Summary	
HCM 6th Ctrl Delay	25.7
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	31	77	166	127	92	120	140	471	117	54	55	46
Future Volume (veh/h)	31	77	166	127	92	120	140	471	117	54	55	46
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	34	84	180	138	100	130	152	512	127	59	60	50
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, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	585	754	639	578	754	639	664	1433	639	399	1433	639
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	1160	1885	1598	1124	1885	1598	1293	3582	1598	796	3582	1598
Grp Volume(v), veh/h	34	84	180	138	100	130	152	512	127	59	60	50
Grp Sat Flow(s),veh/h/ln	1160	1885	1598	1124	1885	1598	1293	1791	1598	796	1791	1598
Q Serve(g_s), s	0.9	1.3	3.4	4.0	1.5	2.4	3.7	4.5	2.3	2.5	0.5	0.9
Cycle Q Clear(g_c), s	2.4	1.3	3.4	5.2	1.5	2.4	4.1	4.5	2.3	7.0	0.5	0.9
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	585	754	639	578	754	639	664	1433	639	399	1433	639
V/C Ratio(X)	0.06	0.11	0.28	0.24	0.13	0.20	0.23	0.36	0.20	0.15	0.04	0.08
Avail Cap(c_a), veh/h	585	754	639	578	754	639	664	1433	639	399	1433	639
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	9.3	8.5	9.1	10.1	8.6	8.8	9.5	9.5	8.8	11.9	8.2	8.4
Incr Delay (d2), s/veh	0.2	0.3	1.1	1.0	0.4	0.7	0.8	0.7	0.7	0.8	0.1	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	0.2	0.5	1.2	1.0	0.6	0.8	1.0	1.5	0.8	0.4	0.1	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.5	8.8	10.2	11.1	8.9	9.5	10.3	10.1	9.5	12.7	8.3	8.6
LnGrp LOS	A	A	B	B	A	A	B	B	A	B	A	A
Approach Vol, veh/h		298			368			791			169	
Approach Delay, s/veh		9.7			9.9			10.1			9.9	
Approach LOS		A			A			B			A	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		6.5		5.4		9.0		7.2				
Green Ext Time (p_c), s		3.4		1.0		0.5		1.2				

Intersection Summary			
HCM 6th Ctrl Delay			10.0
HCM 6th LOS			A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	78	704	325	92	715	229	402	487	158	359	482	137
Future Volume (veh/h)	78	704	325	92	715	229	402	487	158	359	482	137
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	85	765	353	100	777	249	437	529	172	390	524	149
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	288	1421	634	279	1421	634	701	1056	342	680	1094	310
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	550	3554	1585	504	3554	1585	1484	2639	854	1446	2734	774
Grp Volume(v), veh/h	85	765	353	100	777	249	437	355	346	390	340	333
Grp Sat Flow(s),veh/h/ln	550	1777	1585	504	1777	1585	742	1777	1717	723	1777	1731
Q Serve(g_s), s	6.3	7.4	7.7	8.5	7.6	5.0	11.6	6.8	6.8	11.2	6.4	6.4
Cycle Q Clear(g_c), s	13.9	7.4	7.7	15.9	7.6	5.0	18.0	6.8	6.8	18.0	6.4	6.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.50	1.00		0.45
Lane Grp Cap(c), veh/h	288	1421	634	279	1421	634	701	711	687	680	711	692
V/C Ratio(X)	0.30	0.54	0.56	0.36	0.55	0.39	0.62	0.50	0.50	0.57	0.48	0.48
Avail Cap(c_a), veh/h	288	1421	634	279	1421	634	701	711	687	680	711	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	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.7	10.3	10.4	16.4	10.4	9.6	17.5	10.1	10.1	17.3	10.0	10.0
Incr Delay (d2), s/veh	2.6	1.5	3.5	3.6	1.5	1.8	4.1	2.5	2.6	3.5	2.3	2.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	2.0	2.2	1.0	2.0	1.4	2.0	2.0	2.0	1.8	1.9	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.3	11.8	13.9	20.0	11.9	11.4	21.6	12.6	12.8	20.8	12.3	12.4
LnGrp LOS	B	B	B	B	B	B	C	B	B	C	B	B
Approach Vol, veh/h		1203			1126			1138			1063	
Approach Delay, s/veh		12.9			12.5			16.1			15.5	
Approach LOS		B			B			B			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		20.0		15.9		20.0		17.9				
Green Ext Time (p_c), s		0.0		1.3		0.0		0.1				

Intersection Summary			
HCM 6th Ctrl Delay			14.2
HCM 6th LOS			B

Intersection	
Int Delay, s/veh	11.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	21	13	35	12	21	20	19	1007	21	17	902	12
Future Vol, veh/h	21	13	35	12	21	20	19	1007	21	17	902	12
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	-	-	-	-	-	-	140	-	-	145	-	-
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, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	23	14	38	13	23	22	21	1095	23	18	980	13

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1624	2183	497	1682	2178	559	993	0	0	1118	0	0
Stage 1	1023	1023	-	1149	1149	-	-	-	-	-	-	-
Stage 2	601	1160	-	533	1029	-	-	-	-	-	-	-
Critical Hdwy	7.52	6.52	6.92	7.52	6.52	6.92	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.51	4.01	3.31	3.51	4.01	3.31	2.21	-	-	2.21	-	-
Pot Cap-1 Maneuver	69	46	521	62	46	475	698	-	-	626	-	-
Stage 1	254	313	-	213	273	-	-	-	-	-	-	-
Stage 2	456	270	-	501	311	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	37	43	521	41	43	475	698	-	-	626	-	-
Mov Cap-2 Maneuver	37	43	-	41	43	-	-	-	-	-	-	-
Stage 1	246	304	-	207	265	-	-	-	-	-	-	-
Stage 2	386	262	-	430	302	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	205.7	191.4	0.2	0.2
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	698	-	-	74	64	626	-	-
HCM Lane V/C Ratio	0.03	-	-	1.014	0.9	0.03	-	-
HCM Control Delay (s)	10.3	-	-	205.7	191.4	10.9	-	-
HCM Lane LOS	B	-	-	F	F	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	5.4	4.3	0.1	-	-

Intersection	
Int Delay, s/veh	182.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	54	23	93	38	55	53	80	971	52	38	896	49
Future Vol, veh/h	54	23	93	38	55	53	80	971	52	38	896	49
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	-	-	-	-	-	-	185	-	-	190	-	-
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, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	59	25	101	41	60	58	87	1055	57	41	974	53

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1815	2369	514	1840	2367	556	1027	0	0	1112	0	0
Stage 1	1083	1083	-	1258	1258	-	-	-	-	-	-	-
Stage 2	732	1286	-	582	1109	-	-	-	-	-	-	-
Critical Hdwy	7.52	6.52	6.92	7.52	6.52	6.92	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.51	4.01	3.31	3.51	4.01	3.31	2.21	-	-	2.21	-	-
Pot Cap-1 Maneuver	~ 49	35	508	47	~ 35	477	678	-	-	630	-	-
Stage 1	234	294	-	182	243	-	-	-	-	-	-	-
Stage 2	381	235	-	468	286	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	29	508	~ 9	~ 29	477	678	-	-	630	-	-
Mov Cap-2 Maneuver	-	29	-	~ 9	~ 29	-	-	-	-	-	-	-
Stage 1	204	275	-	159	212	-	-	-	-	-	-	-
Stage 2	210	205	-	319	267	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s		$ 2988.4	0.8	0.4
HCM LOS	-	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	678	-	-	-	23	630	-	-
HCM Lane V/C Ratio	0.128	-	-	-	6.9	0.066	-	-
HCM Control Delay (s)	11.1	-	-	$ 2988.4		11.1	-	-
HCM Lane LOS	B	-	-	-	F	B	-	-
HCM 95th %tile Q(veh)	0.4	-	-	-	19.9	0.2	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	7	996	8	6	948
Future Vol, veh/h	3	7	996	8	6	948
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	-	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	3	8	1083	9	7	1030

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1617	546	0	0	1092	0
Stage 1	1088	-	-	-	-	-
Stage 2	529	-	-	-	-	-
Critical Hdwy	6.82	6.92	-	-	4.12	-
Critical Hdwy Stg 1	5.82	-	-	-	-	-
Critical Hdwy Stg 2	5.82	-	-	-	-	-
Follow-up Hdwy	3.51	3.31	-	-	2.21	-
Pot Cap-1 Maneuver	95	484	-	-	641	-
Stage 1	287	-	-	-	-	-
Stage 2	558	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	94	484	-	-	641	-
Mov Cap-2 Maneuver	208	-	-	-	-	-
Stage 1	284	-	-	-	-	-
Stage 2	558	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.7	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	346	641	-
HCM Lane V/C Ratio	-	-	0.031	0.01	-
HCM Control Delay (s)	-	-	15.7	10.7	-
HCM Lane LOS	-	-	C	B	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection						
Int Delay, s/veh	0.6					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	13	971	71	28	940
Future Vol, veh/h	25	13	971	71	28	940
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	-	-	-	90	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	27	14	1055	77	30	1022

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1665	566	0	0	1132	0
Stage 1	1094	-	-	-	-	-
Stage 2	571	-	-	-	-	-
Critical Hdwy	6.82	6.92	-	-	4.12	-
Critical Hdwy Stg 1	5.82	-	-	-	-	-
Critical Hdwy Stg 2	5.82	-	-	-	-	-
Follow-up Hdwy	3.51	3.31	-	-	2.21	-
Pot Cap-1 Maneuver	89	470	-	-	619	-
Stage 1	285	-	-	-	-	-
Stage 2	531	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	85	470	-	-	619	-
Mov Cap-2 Maneuver	195	-	-	-	-	-
Stage 1	271	-	-	-	-	-
Stage 2	531	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	22.7	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	244	619	-
HCM Lane V/C Ratio	-	-	0.169	0.049	-
HCM Control Delay (s)	-	-	22.7	11.1	-
HCM Lane LOS	-	-	C	B	-
HCM 95th %tile Q(veh)	-	-	0.6	0.2	-

Intersection	
Int Delay, s/veh	92.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	82	163	839	139	221	784
Future Vol, veh/h	82	163	839	139	221	784
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	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	89	177	912	151	240	852

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1894	532	0	0	1063	0
Stage 1	988	-	-	-	-	-
Stage 2	906	-	-	-	-	-
Critical Hdwy	6.82	6.92	-	-	4.12	-
Critical Hdwy Stg 1	5.82	-	-	-	-	-
Critical Hdwy Stg 2	5.82	-	-	-	-	-
Follow-up Hdwy	3.51	3.31	-	-	2.21	-
Pot Cap-1 Maneuver	~ 62	495	-	-	657	-
Stage 1	323	-	-	-	-	-
Stage 2	357	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 39	495	-	-	657	-
Mov Cap-2 Maneuver	~ 39	-	-	-	-	-
Stage 1	205	-	-	-	-	-
Stage 2	357	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	$ 830.7	0	3
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	101	657	-
HCM Lane V/C Ratio	-	-	2.637	0.366	-
HCM Control Delay (s)	-	-	$ 830.7	13.6	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	24.7	1.7	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	1259	443	54	655	5	402	148	69	34	109	8
Future Volume (veh/h)	8	1259	443	54	655	5	402	148	69	34	109	8
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	9	1368	482	59	712	5	437	161	75	37	118	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	343	1421	634	166	1421	634	609	483	225	512	686	52
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	734	3554	1585	249	3554	1585	1264	1207	562	1144	1716	131
Grp Volume(v), veh/h	9	1368	482	59	712	5	437	0	236	37	0	127
Grp Sat Flow(s),veh/h/ln	734	1777	1585	249	1777	1585	1264	0	1769	1144	0	1847
Q Serve(g_s), s	0.4	16.9	11.8	1.1	6.8	0.1	15.3	0.0	4.2	1.0	0.0	2.0
Cycle Q Clear(g_c), s	7.2	16.9	11.8	18.0	6.8	0.1	17.3	0.0	4.2	5.2	0.0	2.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.32	1.00		0.07
Lane Grp Cap(c), veh/h	343	1421	634	166	1421	634	609	0	708	512	0	739
V/C Ratio(X)	0.03	0.96	0.76	0.36	0.50	0.01	0.72	0.00	0.33	0.07	0.00	0.17
Avail Cap(c_a), veh/h	343	1421	634	166	1421	634	609	0	708	512	0	739
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.8	13.2	11.6	22.4	10.1	8.1	14.3	0.0	9.3	11.1	0.0	8.7
Incr Delay (d2), s/veh	0.1	16.4	8.4	5.9	1.3	0.0	7.1	0.0	1.3	0.3	0.0	0.5
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	0.1	7.1	3.9	0.8	1.8	0.0	4.3	0.0	1.4	0.2	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.0	29.6	20.0	28.3	11.4	8.1	21.4	0.0	10.6	11.4	0.0	9.2
LnGrp LOS	B	C	B	C	B	A	C	A	B	B	A	A
Approach Vol, veh/h		1859			776			673			164	
Approach Delay, s/veh		27.0			12.7			17.6			9.7	
Approach LOS		C			B			B			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		19.3		18.9		7.2		20.0				
Green Ext Time (p_c), s		0.0		0.0		0.5		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			21.2									
HCM 6th LOS			C									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↑	↱	↰	↑↑	↱
Traffic Volume (veh/h)	9	51	66	106	65	73	153	637	283	132	657	23
Future Volume (veh/h)	9	51	66	106	65	73	153	637	283	132	657	23
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	10	55	72	115	71	79	166	692	308	143	714	25
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, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	332	321	272	345	321	272	621	2278	1016	471	2278	1016
Arrive On Green	0.17	0.17	0.17	0.17	0.17	0.17	0.63	0.63	0.63	1.00	1.00	1.00
Sat Flow, veh/h	1257	1900	1610	1284	1900	1610	731	3610	1610	572	3610	1610
Grp Volume(v), veh/h	10	55	72	115	71	79	166	692	308	143	714	25
Grp Sat Flow(s),veh/h/ln	1257	1900	1610	1284	1900	1610	731	1805	1610	572	1805	1610
Q Serve(g_s), s	0.3	1.1	1.8	3.8	1.5	1.9	4.9	3.9	3.9	2.6	0.0	0.0
Cycle Q Clear(g_c), s	1.8	1.1	1.8	4.9	1.5	1.9	4.9	3.9	3.9	6.5	0.0	0.0
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	332	321	272	345	321	272	621	2278	1016	471	2278	1016
V/C Ratio(X)	0.03	0.17	0.26	0.33	0.22	0.29	0.27	0.30	0.30	0.30	0.31	0.02
Avail Cap(c_a), veh/h	622	760	644	642	760	644	621	2278	1016	471	2278	1016
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
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	16.9	16.0	16.3	18.1	16.1	16.3	4.0	3.8	3.8	0.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.5	0.6	0.3	0.6	1.1	0.3	0.8	1.7	0.4	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	0.1	0.5	0.6	1.1	0.6	0.7	0.6	0.8	0.9	0.2	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.9	16.2	16.8	18.7	16.5	16.9	5.0	4.1	4.6	2.1	0.4	0.0
LnGrp LOS	B	B	B	B	B	B	A	A	A	A	A	A
Approach Vol, veh/h		137			265			1166			882	
Approach Delay, s/veh		16.6			17.6			4.4			0.6	
Approach LOS		B			B			A			A	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	32.9	12.1	32.9	12.1
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	18.0	18.0	18.0	18.0
Max Q Clear Time (g_c+I1), s	6.9	3.8	8.5	6.9
Green Ext Time (p_c), s	5.3	0.4	4.1	0.8

Intersection Summary	
HCM 6th Ctrl Delay	5.1
HCM 6th LOS	A

Synchro Reports

Cumulative plus Project Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	82	425	317	92	830	230	468	274	75	358	466	174
Future Volume (veh/h)	82	425	317	92	830	230	468	274	75	358	466	174
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1841	1841	1841	1841	1841	1841	1841	1841	1841
Adj Flow Rate, veh/h	89	462	345	100	902	250	509	298	82	389	507	189
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	252	1399	624	365	1399	624	672	1088	294	942	999	370
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	480	3497	1560	665	3497	1560	1430	2721	736	1915	2497	926
Grp Volume(v), veh/h	89	462	345	100	902	250	509	190	190	389	354	342
Grp Sat Flow(s),veh/h/ln	480	1749	1560	665	1749	1560	715	1749	1708	957	1749	1674
Q Serve(g_s), s	8.3	4.1	7.7	5.5	9.4	5.2	11.1	3.3	3.4	7.7	6.9	6.9
Cycle Q Clear(g_c), s	17.7	4.1	7.7	9.6	9.4	5.2	18.0	3.3	3.4	11.1	6.9	6.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.43	1.00		0.55
Lane Grp Cap(c), veh/h	252	1399	624	365	1399	624	672	699	683	942	699	670
V/C Ratio(X)	0.35	0.33	0.55	0.27	0.64	0.40	0.76	0.27	0.28	0.41	0.51	0.51
Avail Cap(c_a), veh/h	252	1399	624	365	1399	624	672	699	683	942	699	670
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	18.1	9.3	10.4	12.7	10.9	9.6	18.7	9.1	9.1	12.9	10.2	10.2
Incr Delay (d2), s/veh	3.9	0.6	3.5	1.8	2.3	1.9	7.8	1.0	1.0	1.3	2.6	2.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	1.0	2.1	0.7	2.6	1.4	2.9	0.9	0.9	1.3	2.1	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.9	10.0	13.9	14.5	13.2	11.6	26.5	10.0	10.1	14.2	12.8	12.9
LnGrp LOS	C	A	B	B	B	B	C	B	B	B	B	B
Approach Vol, veh/h		896			1252			889			1085	
Approach Delay, s/veh		12.7			13.0			19.5			13.3	
Approach LOS		B			B			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		20.0		19.7		13.1		11.6				
Green Ext Time (p_c), s		0.0		0.0		2.5		3.6				
Intersection Summary												
HCM 6th Ctrl Delay			14.4									
HCM 6th LOS			B									

Intersection	
Int Delay, s/veh	6.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	45	7	50	7	14	4	35	691	4	7	829	37
Future Vol, veh/h	45	7	50	7	14	4	35	691	4	7	829	37
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	-	-	-	-	-	-	140	-	-	145	-	-
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	49	8	54	8	15	4	38	751	4	8	901	40

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1396	1768	471	1300	1786	378	941	0	0	755	0	0
Stage 1	937	937	-	829	829	-	-	-	-	-	-	-
Stage 2	459	831	-	471	957	-	-	-	-	-	-	-
Critical Hdwy	7.56	6.56	6.96	7.56	6.56	6.96	4.16	-	-	4.16	-	-
Critical Hdwy Stg 1	6.56	5.56	-	6.56	5.56	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.56	5.56	-	6.56	5.56	-	-	-	-	-	-	-
Follow-up Hdwy	3.53	4.03	3.33	3.53	4.03	3.33	2.23	-	-	2.23	-	-
Pot Cap-1 Maneuver	100	82	536	118	80	617	718	-	-	845	-	-
Stage 1	283	339	-	329	381	-	-	-	-	-	-	-
Stage 2	549	380	-	540	332	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	80	77	536	93	75	617	718	-	-	845	-	-
Mov Cap-2 Maneuver	80	77	-	93	75	-	-	-	-	-	-	-
Stage 1	268	336	-	312	361	-	-	-	-	-	-	-
Stage 2	495	360	-	470	329	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	95.2	59	0.5	0.1
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	718	-	-	137	93	845	-	-
HCM Lane V/C Ratio	0.053	-	-	0.809	0.292	0.009	-	-
HCM Control Delay (s)	10.3	-	-	95.2	59	9.3	-	-
HCM Lane LOS	B	-	-	F	F	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	5	1.1	0	-	-

Intersection												
Int Delay, s/veh	69.3											
Movement	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**
Lane Configurations		✥			✥		↰	↑↱		↰	↑↑	
Traffic Vol, veh/h	54	20	95	43	62	57	72	659	22	67	819	40
Future Vol, veh/h	54	20	95	43	62	57	72	659	22	67	819	40
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	-	-	-	-	-	-	185	-	-	190	-	-
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	59	22	103	47	67	62	78	716	24	73	890	43

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1606	1954	467	1486	1963	370	933	0	0	740	0	0
Stage 1	1058	1058	-	884	884	-	-	-	-	-	-	-
Stage 2	548	896	-	602	1079	-	-	-	-	-	-	-
Critical Hdwy	7.56	6.56	6.96	7.56	6.56	6.96	4.16	-	-	4.16	-	-
Critical Hdwy Stg 1	6.56	5.56	-	6.56	5.56	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.56	5.56	-	6.56	5.56	-	-	-	-	-	-	-
Follow-up Hdwy	3.53	4.03	3.33	3.53	4.03	3.33	2.23	-	-	2.23	-	-
Pot Cap-1 Maneuver	69	63	540	85	~ 62	624	723	-	-	856	-	-
Stage 1	238	297	-	305	359	-	-	-	-	-	-	-
Stage 2	486	355	-	451	291	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	51	540	~ 40	~ 51	624	723	-	-	856	-	-
Mov Cap-2 Maneuver	-	51	-	~ 40	~ 51	-	-	-	-	-	-	-
Stage 1	212	272	-	272	320	-	-	-	-	-	-	-
Stage 2	308	317	-	307	266	-	-	-	-	-	-	-
Approach	**EB**			**WB**			**NB**			**SB**		
HCM Control Delay, s				$ 851			1			0.7		
HCM LOS	-			F								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	723	-	-	-	68	856	-	-
HCM Lane V/C Ratio	0.108	-	-	-	2.59	0.085	-	-
HCM Control Delay (s)	10.6	-	-	-	$ 851	9.6	-	-
HCM Lane LOS	B	-	-	-	F	A	-	-
HCM 95th %tile Q(veh)	0.4	-	-	-	17.3	0.3	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	15	682	6	8	887
Future Vol, veh/h	2	15	682	6	8	887
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	-	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	2	16	741	7	9	964

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1245	374	0	0	748	0
Stage 1	745	-	-	-	-	-
Stage 2	500	-	-	-	-	-
Critical Hdwy	6.86	6.96	-	-	4.16	-
Critical Hdwy Stg 1	5.86	-	-	-	-	-
Critical Hdwy Stg 2	5.86	-	-	-	-	-
Follow-up Hdwy	3.53	3.33	-	-	2.23	-
Pot Cap-1 Maneuver	165	621	-	-	850	-
Stage 1	427	-	-	-	-	-
Stage 2	572	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	163	621	-	-	850	-
Mov Cap-2 Maneuver	292	-	-	-	-	-
Stage 1	422	-	-	-	-	-
Stage 2	572	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.8	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	548	850	-
HCM Lane V/C Ratio	-	-	0.034	0.01	-
HCM Control Delay (s)	-	-	11.8	9.3	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	0.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	40	628	14	17	892
Future Vol, veh/h	25	40	628	14	17	892
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	-	-	-	90	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	27	43	683	15	18	970

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1212	349	0	0	698	0
Stage 1	691	-	-	-	-	-
Stage 2	521	-	-	-	-	-
Critical Hdwy	6.86	6.96	-	-	4.16	-
Critical Hdwy Stg 1	5.86	-	-	-	-	-
Critical Hdwy Stg 2	5.86	-	-	-	-	-
Follow-up Hdwy	3.53	3.33	-	-	2.23	-
Pot Cap-1 Maneuver	173	644	-	-	888	-
Stage 1	456	-	-	-	-	-
Stage 2	558	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	170	644	-	-	888	-
Mov Cap-2 Maneuver	300	-	-	-	-	-
Stage 1	447	-	-	-	-	-
Stage 2	558	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.6	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	447	888	-
HCM Lane V/C Ratio	-	-	0.158	0.021	-
HCM Control Delay (s)	-	-	14.6	9.1	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.6	0.1	-

Intersection	
Int Delay, s/veh	15.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	68	269	391	54	188	769
Future Vol, veh/h	68	269	391	54	188	769
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	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	74	292	425	59	204	836

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1281	242	0	0	484	0
Stage 1	455	-	-	-	-	-
Stage 2	826	-	-	-	-	-
Critical Hdwy	6.86	6.96	-	-	4.16	-
Critical Hdwy Stg 1	5.86	-	-	-	-	-
Critical Hdwy Stg 2	5.86	-	-	-	-	-
Follow-up Hdwy	3.53	3.33	-	-	2.23	-
Pot Cap-1 Maneuver	156	756	-	-	1068	-
Stage 1	603	-	-	-	-	-
Stage 2	388	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	126	756	-	-	1068	-
Mov Cap-2 Maneuver	126	-	-	-	-	-
Stage 1	488	-	-	-	-	-
Stage 2	388	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	73.8	0	1.8
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	376	1068	-
HCM Lane V/C Ratio	-	-	0.974	0.191	-
HCM Control Delay (s)	-	-	73.8	9.2	-
HCM Lane LOS	-	-	F	A	-
HCM 95th %tile Q(veh)	-	-	11.1	0.7	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	684	201	60	1085	4	712	135	103	3	99	17
Future Volume (veh/h)	13	684	201	60	1085	4	712	135	103	3	99	17
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	14	743	218	65	1179	4	774	147	112	3	108	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	208	1421	634	301	1421	634	610	394	300	490	625	104
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	474	3554	1585	584	3554	1585	1265	985	750	1120	1563	260
Grp Volume(v), veh/h	14	743	218	65	1179	4	774	0	259	3	0	126
Grp Sat Flow(s),veh/h/ln	474	1777	1585	584	1777	1585	1265	0	1735	1120	0	1823
Q Serve(g_s), s	1.2	7.1	4.3	4.3	13.4	0.1	16.0	0.0	4.7	0.1	0.0	2.0
Cycle Q Clear(g_c), s	14.6	7.1	4.3	11.4	13.4	0.1	18.0	0.0	4.7	4.8	0.0	2.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.43	1.00		0.14
Lane Grp Cap(c), veh/h	208	1421	634	301	1421	634	610	0	694	490	0	729
V/C Ratio(X)	0.07	0.52	0.34	0.22	0.83	0.01	1.27	0.00	0.37	0.01	0.00	0.17
Avail Cap(c_a), veh/h	208	1421	634	301	1421	634	610	0	694	490	0	729
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	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.7	10.2	9.4	14.6	12.1	8.1	16.6	0.0	9.5	11.2	0.0	8.7
Incr Delay (d2), s/veh	0.6	1.4	1.5	1.6	5.7	0.0	134.0	0.0	1.5	0.0	0.0	0.5
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	0.1	1.9	1.1	0.5	4.2	0.0	28.3	0.0	1.6	0.0	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.3	11.6	10.9	16.2	17.9	8.1	150.6	0.0	11.1	11.2	0.0	9.2
LnGrp LOS	B	B	B	B	B	A	F	A	B	B	A	A
Approach Vol, veh/h		975			1248			1033			129	
Approach Delay, s/veh		11.6			17.7			115.6			9.3	
Approach LOS		B			B			F			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		20.0		16.6		6.8		15.4				
Green Ext Time (p_c), s		0.0		0.7		0.4		1.8				
Intersection Summary												
HCM 6th Ctrl Delay			45.5									
HCM 6th LOS			D									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	31	77	166	144	92	143	140	491	119	61	568	46
Future Volume (veh/h)	31	77	166	144	92	143	140	491	119	61	568	46
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	34	84	180	157	100	155	152	534	129	66	617	50
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, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	575	754	639	578	754	639	347	1433	639	390	1433	639
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.13	0.13	0.13
Sat Flow, veh/h	1133	1885	1598	1124	1885	1598	775	3582	1598	778	3582	1598
Grp Volume(v), veh/h	34	84	180	157	100	155	152	534	129	66	617	50
Grp Sat Flow(s),veh/h/ln	1133	1885	1598	1124	1885	1598	775	1791	1598	778	1791	1598
Q Serve(g_s), s	0.9	1.3	3.4	4.6	1.5	2.9	8.3	4.7	2.4	3.5	7.1	1.2
Cycle Q Clear(g_c), s	2.4	1.3	3.4	5.8	1.5	2.9	15.5	4.7	2.4	8.3	7.1	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	575	754	639	578	754	639	347	1433	639	390	1433	639
V/C Ratio(X)	0.06	0.11	0.28	0.27	0.13	0.24	0.44	0.37	0.20	0.17	0.43	0.08
Avail Cap(c_a), veh/h	575	754	639	578	754	639	347	1433	639	390	1433	639
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	9.3	8.5	9.1	10.3	8.6	9.0	16.1	9.5	8.8	17.5	14.8	12.3
Incr Delay (d2), s/veh	0.2	0.3	1.1	1.2	0.4	0.9	4.0	0.7	0.7	0.9	0.9	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	0.2	0.5	1.2	1.1	0.6	1.0	1.6	1.6	0.8	0.7	2.6	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.5	8.8	10.2	11.5	8.9	9.9	20.1	10.3	9.5	18.4	15.8	12.5
LnGrp LOS	A	A	B	B	A	A	C	B	A	B	B	B
Approach Vol, veh/h		298			412			815			733	
Approach Delay, s/veh		9.7			10.2			12.0			15.8	
Approach LOS		A			B			B			B	

Timer - Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0
Max Q Clear Time (g_c+I1), s		17.5		5.4		10.3		7.8
Green Ext Time (p_c), s		0.3		1.0		2.7		1.3

Intersection Summary	
HCM 6th Ctrl Delay	12.6
HCM 6th LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰↰	↑↱		↰↰	↑↱	
Traffic Volume (veh/h)	78	704	553	126	715	229	618	562	190	359	562	137
Future Volume (veh/h)	78	704	553	126	715	229	618	562	190	359	562	137
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	85	765	601	137	777	249	672	611	207	390	611	149
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	288	1421	634	254	1421	634	641	1043	353	600	1133	276
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	550	3554	1585	398	3554	1585	1369	2607	882	1297	2833	690
Grp Volume(v), veh/h	85	765	601	137	777	249	672	416	402	390	383	377
Grp Sat Flow(s),veh/h/ln	550	1777	1585	398	1777	1585	684	1777	1712	648	1777	1746
Q Serve(g_s), s	6.3	7.4	16.5	10.6	7.6	5.0	10.6	8.3	8.3	9.7	7.4	7.4
Cycle Q Clear(g_c), s	13.9	7.4	16.5	18.0	7.6	5.0	18.0	8.3	8.3	18.0	7.4	7.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.52	1.00		0.39
Lane Grp Cap(c), veh/h	288	1421	634	254	1421	634	641	711	685	600	711	698
V/C Ratio(X)	0.30	0.54	0.95	0.54	0.55	0.39	1.05	0.59	0.59	0.65	0.54	0.54
Avail Cap(c_a), veh/h	288	1421	634	254	1421	634	641	711	685	600	711	698
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	15.7	10.3	13.0	18.9	10.4	9.6	19.9	10.6	10.6	19.0	10.3	10.3
Incr Delay (d2), s/veh	2.6	1.5	25.0	8.0	1.5	1.8	48.8	3.5	3.7	5.4	2.9	3.0
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	0.8	2.0	7.8	1.7	2.0	1.4	7.1	2.6	2.5	2.1	2.3	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.3	11.8	38.0	26.9	11.9	11.4	68.6	14.1	14.2	24.4	13.2	13.3
LnGrp LOS	B	B	D	C	B	B	F	B	B	C	B	B
Approach Vol, veh/h		1451			1163			1490			1150	
Approach Delay, s/veh		23.0			13.6			38.7			17.0	
Approach LOS		C			B			D			B	

Timer - Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0
Max Q Clear Time (g_c+I1), s		20.0		18.5		20.0		20.0
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0

Intersection Summary	
HCM 6th Ctrl Delay	24.1
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	44.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	102	15	106	13	24	22	95	1129	22	19	1018	97
Future Vol, veh/h	102	15	106	13	24	22	95	1129	22	19	1018	97
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	-	-	-	-	-	-	140	-	-	145	-	-
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, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	111	16	115	14	26	24	103	1227	24	21	1107	105

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2035	2659	606	2049	2699	626	1212	0	0	1251	0	0
Stage 1	1202	1202	-	1445	1445	-	-	-	-	-	-	-
Stage 2	833	1457	-	604	1254	-	-	-	-	-	-	-
Critical Hdwy	7.52	6.52	6.92	7.52	6.52	6.92	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.51	4.01	3.31	3.51	4.01	3.31	2.21	-	-	2.21	-	-
Pot Cap-1 Maneuver	~ 34	23	443	33	~ 21	429	577	-	-	558	-	-
Stage 1	197	258	-	140	197	-	-	-	-	-	-	-
Stage 2	331	194	-	455	244	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	18	443	~ 5	~ 17	429	577	-	-	558	-	-
Mov Cap-2 Maneuver	-	18	-	~ 5	~ 17	-	-	-	-	-	-	-
Stage 1	162	248	-	115	162	-	-	-	-	-	-	-
Stage 2	215	159	-	303	235	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s		$ 1984.4	1	0.2
HCM LOS	-	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	577	-	-	-	15	558	-	-
HCM Lane V/C Ratio	0.179	-	-	-	4.275	0.037	-	-
HCM Control Delay (s)	12.6	-	-	-	$ 1984.4	11.7	-	-
HCM Lane LOS	B	-	-	-	F	B	-	-
HCM 95th %tile Q(veh)	0.6	-	-	-	8.9	0.1	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	71	24	128	38	56	58	116	1151	52	42	1065	66
Future Vol, veh/h	71	24	128	38	56	58	116	1151	52	42	1065	66
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	-	-	-	-	-	-	185	-	-	190	-	-
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, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	77	26	139	41	61	63	126	1251	57	46	1158	72

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2194	2846	615	2216	2854	654	1230	0	0	1308	0	0
Stage 1	1286	1286	-	1532	1532	-	-	-	-	-	-	-
Stage 2	908	1560	-	684	1322	-	-	-	-	-	-	-
Critical Hdwy	7.52	6.52	6.92	7.52	6.52	6.92	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.51	4.01	3.31	3.51	4.01	3.31	2.21	-	-	2.21	-	-
Pot Cap-1 Maneuver	~ 25	~ 17	437	~ 24	~ 17	412	568	-	-	530	-	-
Stage 1	175	235	-	123	179	-	-	-	-	-	-	-
Stage 2	299	173	-	407	226	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	~ 12	437	-	~ 12	412	568	-	-	530	-	-
Mov Cap-2 Maneuver	-	~ 12	-	-	~ 12	-	-	-	-	-	-	-
Stage 1	136	215	-	96	139	-	-	-	-	-	-	-
Stage 2	111	135	-	223	206	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			1.2	0.4
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	568	-	-	-	-	530	-	-
HCM Lane V/C Ratio	0.222	-	-	-	-	0.086	-	-
HCM Control Delay (s)	13.1	-	-	-	-	12.4	-	-
HCM Lane LOS	B	-	-	-	-	B	-	-
HCM 95th %tile Q(veh)	0.8	-	-	-	-	0.3	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection						
Int Delay, s/veh	0.2					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↑↱		↰	↑↑
Traffic Vol, veh/h	3	13	1207	8	11	1147
Future Vol, veh/h	3	13	1207	8	11	1147
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	-	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	3	14	1312	9	12	1247

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1965	661	0	0	1321	0
Stage 1	1317	-	-	-	-	-
Stage 2	648	-	-	-	-	-
Critical Hdwy	6.82	6.92	-	-	4.12	-
Critical Hdwy Stg 1	5.82	-	-	-	-	-
Critical Hdwy Stg 2	5.82	-	-	-	-	-
Follow-up Hdwy	3.51	3.31	-	-	2.21	-
Pot Cap-1 Maneuver	56	407	-	-	524	-
Stage 1	217	-	-	-	-	-
Stage 2	485	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	55	407	-	-	524	-
Mov Cap-2 Maneuver	154	-	-	-	-	-
Stage 1	212	-	-	-	-	-
Stage 2	485	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.3	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	311	524	-
HCM Lane V/C Ratio	-	-	0.056	0.023	-
HCM Control Delay (s)	-	-	17.3	12	-
HCM Lane LOS	-	-	C	B	-
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Intersection	
Int Delay, s/veh	0.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	19	1176	71	33	1134
Future Vol, veh/h	25	19	1176	71	33	1134
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	-	-	-	90	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	27	21	1278	77	36	1233

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2006	678	0	0	1355	0
Stage 1	1317	-	-	-	-	-
Stage 2	689	-	-	-	-	-
Critical Hdwy	6.82	6.92	-	-	4.12	-
Critical Hdwy Stg 1	5.82	-	-	-	-	-
Critical Hdwy Stg 2	5.82	-	-	-	-	-
Follow-up Hdwy	3.51	3.31	-	-	2.21	-
Pot Cap-1 Maneuver	52	397	-	-	509	-
Stage 1	217	-	-	-	-	-
Stage 2	462	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	48	397	-	-	509	-
Mov Cap-2 Maneuver	144	-	-	-	-	-
Stage 1	202	-	-	-	-	-
Stage 2	462	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	28.7	0	0.4
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	199	509	-
HCM Lane V/C Ratio	-	-	0.24	0.07	-
HCM Control Delay (s)	-	-	28.7	12.6	-
HCM Lane LOS	-	-	D	B	-
HCM 95th %tile Q(veh)	-	-	0.9	0.2	-

Intersection	
Int Delay, s/veh	213.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	82	191	1015	139	248	951
Future Vol, veh/h	82	191	1015	139	248	951
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	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	89	208	1103	151	270	1034

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2236	627	0	0	1254	0
Stage 1	1179	-	-	-	-	-
Stage 2	1057	-	-	-	-	-
Critical Hdwy	6.82	6.92	-	-	4.12	-
Critical Hdwy Stg 1	5.82	-	-	-	-	-
Critical Hdwy Stg 2	5.82	-	-	-	-	-
Follow-up Hdwy	3.51	3.31	-	-	2.21	-
Pot Cap-1 Maneuver	~ 36	429	-	-	556	-
Stage 1	257	-	-	-	-	-
Stage 2	298	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 19	429	-	-	556	-
Mov Cap-2 Maneuver	~ 19	-	-	-	-	-
Stage 1	132	-	-	-	-	-
Stage 2	298	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	$ 2036	0	3.6
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	57	556	-
HCM Lane V/C Ratio	-	-	5.206	0.485	-
HCM Control Delay (s)	-	-	$ 2036	17.4	-
HCM Lane LOS	-	-	F	C	-
HCM 95th %tile Q(veh)	-	-	33.3	2.6	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	1259	613	155	655	5	523	161	146	34	126	8
Future Volume (veh/h)	8	1259	613	155	655	5	523	161	146	34	126	8
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	9	1368	666	168	712	5	568	175	159	37	137	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	343	1421	634	165	1421	634	593	361	328	428	694	46
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	734	3554	1585	208	3554	1585	1242	903	820	1046	1736	114
Grp Volume(v), veh/h	9	1368	666	168	712	5	568	0	334	37	0	146
Grp Sat Flow(s),veh/h/ln	734	1777	1585	208	1777	1585	1242	0	1723	1046	0	1850
Q Serve(g_s), s	0.4	16.9	18.0	1.1	6.8	0.1	15.7	0.0	6.5	1.2	0.0	2.3
Cycle Q Clear(g_c), s	7.2	16.9	18.0	18.0	6.8	0.1	18.0	0.0	6.5	7.7	0.0	2.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.48	1.00		0.06
Lane Grp Cap(c), veh/h	343	1421	634	165	1421	634	593	0	689	428	0	740
V/C Ratio(X)	0.03	0.96	1.05	1.02	0.50	0.01	0.96	0.00	0.48	0.09	0.00	0.20
Avail Cap(c_a), veh/h	343	1421	634	165	1421	634	593	0	689	428	0	740
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	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.8	13.2	13.5	22.5	10.1	8.1	16.5	0.0	10.0	12.9	0.0	8.8
Incr Delay (d2), s/veh	0.1	16.4	49.7	74.7	1.3	0.0	27.9	0.0	2.4	0.4	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	7.1	12.4	4.8	1.8	0.0	9.6	0.0	2.2	0.3	0.0	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.0	29.6	63.2	97.2	11.4	8.1	44.5	0.0	12.5	13.3	0.0	9.4
LnGrp LOS	B	C	F	F	B	A	D	A	B	B	A	A
Approach Vol, veh/h		2043			885			902			183	
Approach Delay, s/veh		40.5			27.7			32.6			10.2	
Approach LOS		D			C			C			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		20.0		20.0		9.7		20.0				
Green Ext Time (p_c), s		0.0		0.0		0.5		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			34.5									
HCM 6th LOS			C									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↑	↱	↰	↑↑	↱
Traffic Volume (veh/h)	9	51	66	116	65	86	153	701	289	154	700	23
Future Volume (veh/h)	9	51	66	116	65	86	153	701	289	154	700	23
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	10	55	72	126	71	93	166	762	314	167	761	25
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, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	342	339	287	357	339	287	595	2244	1001	437	2244	1001
Arrive On Green	0.18	0.18	0.18	0.18	0.18	0.18	0.62	0.62	0.62	1.00	1.00	1.00
Sat Flow, veh/h	1241	1900	1610	1284	1900	1610	700	3610	1610	533	3610	1610
Grp Volume(v), veh/h	10	55	72	126	71	93	166	762	314	167	761	25
Grp Sat Flow(s),veh/h/ln	1241	1900	1610	1284	1900	1610	700	1805	1610	533	1805	1610
Q Serve(g_s), s	0.3	1.1	1.7	4.1	1.4	2.3	5.3	4.6	4.1	4.6	0.0	0.0
Cycle Q Clear(g_c), s	1.7	1.1	1.7	5.2	1.4	2.3	5.3	4.6	4.1	9.2	0.0	0.0
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	342	339	287	357	339	287	595	2244	1001	437	2244	1001
V/C Ratio(X)	0.03	0.16	0.25	0.35	0.21	0.32	0.28	0.34	0.31	0.38	0.34	0.02
Avail Cap(c_a), veh/h	617	760	644	642	760	644	595	2244	1001	437	2244	1001
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
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	16.5	15.6	15.9	17.9	15.8	16.1	4.2	4.1	4.0	0.7	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.5	0.6	0.3	0.6	1.2	0.4	0.8	2.5	0.4	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	0.1	0.5	0.6	1.2	0.6	0.8	0.6	1.0	1.0	0.3	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.6	15.9	16.4	18.5	16.1	16.8	5.4	4.5	4.8	3.3	0.4	0.0
LnGrp LOS	B	B	B	B	B	B	A	A	A	A	A	A
Approach Vol, veh/h		137			290			1242			953	
Approach Delay, s/veh		16.2			17.3			4.7			0.9	
Approach LOS		B			B			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		32.5		12.5		32.5		12.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		7.3		3.7		11.2		7.2				
Green Ext Time (p_c), s		5.6		0.4		3.6		0.8				
Intersection Summary												
HCM 6th Ctrl Delay			5.3									
HCM 6th LOS			A									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	0	0	0	0	0	0	0	0
Future Volume (veh/h)	0	0	0	0	0	0	0	0	0	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	748	0	0	748	0	160	748	0	160	748	0
Arrive On Green	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sat Flow, veh/h	0	1870	0	0	1870	0	1781	1870	0	1781	1870	0
Grp Volume(v), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	0	1870	0	1781	1870	0	1781	1870	0
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop In Lane	0.00		0.00	0.00		0.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	0	748	0	0	748	0	160	748	0	160	748	0
V/C Ratio(X)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Avail Cap(c_a), veh/h	0	748	0	0	748	0	160	748	0	160	748	0
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)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d), 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
Incr Delay (d2), 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
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),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
LnGrp LOS	A	A	A	A	A	A	A	A	A	A	A	A
Approach Vol, veh/h		0			0			0			0	
Approach Delay, s/veh		0.0			0.0			0.0			0.0	
Approach LOS												
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		0.0		0.0		0.0		0.0				
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			0.0									
HCM 6th LOS			A									

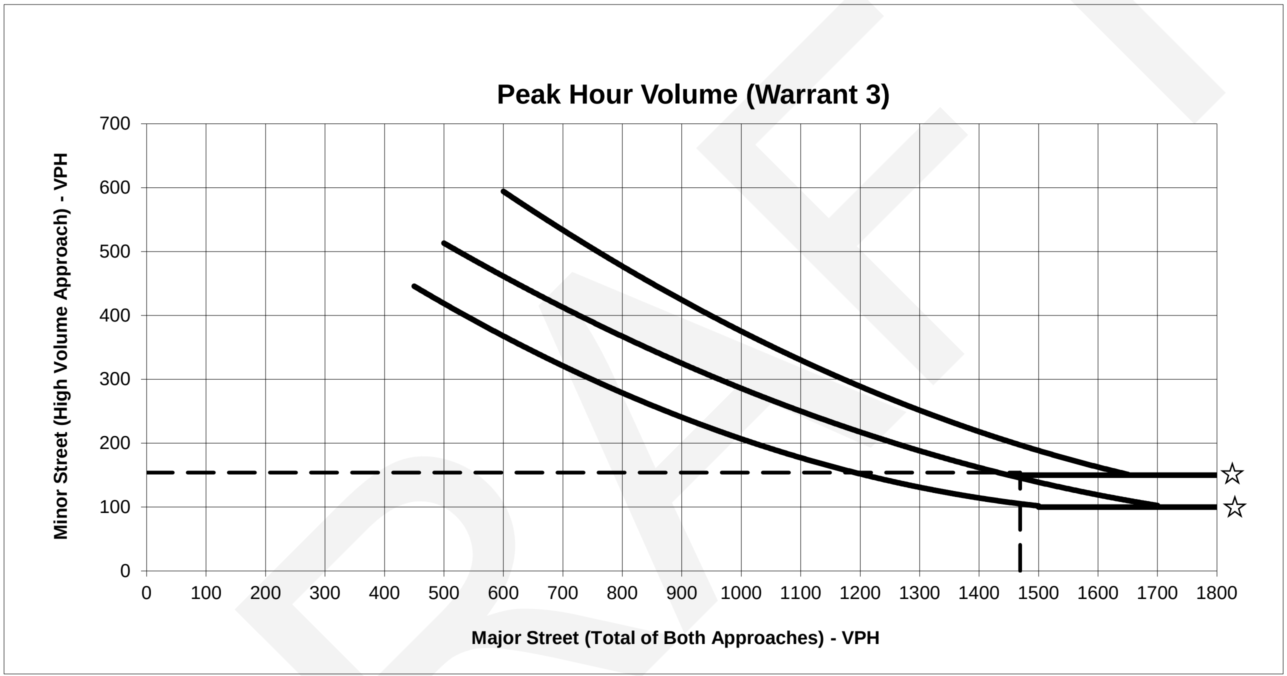
WARRANTS

Warrant Worksheets

Existing plus Project Conditions

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
500	420	500	505	500	N/A
600	360	600	460	600	590
700	325	700	420	700	540
800	285	800	360	800	475
900	245	900	325	900	425
1000	200	1000	285	1000	370
1100	175	1100	250	1100	340
1200	150	1200	220	1200	285
1300	130	1300	190	1300	250
1400	120	1400	155	1400	220
1500	100	1500	145	1500	180
1600	100	1600	120	1600	170
1700	100	1700	100	1650	150
1800	100	1800	100	1800	150

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*

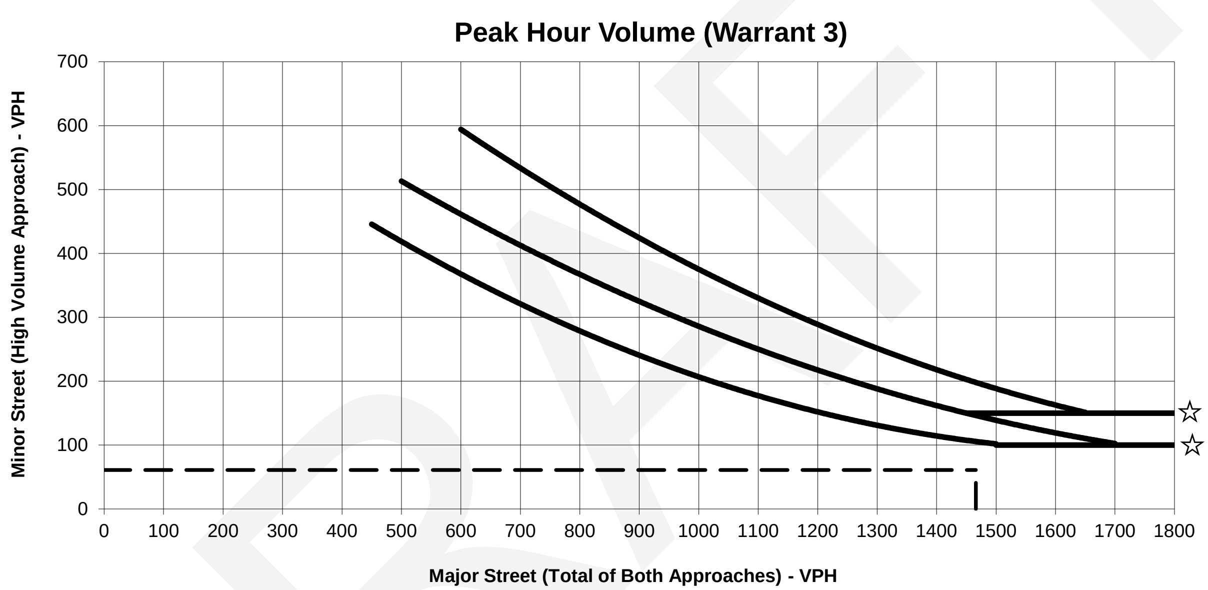


☆ NOTE:
150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Scenario (AM/PM)	Existing + Project (PM) #2	
	Roadway	**Number of Lanes**
Major Approach:	Academy Ave	4
Minor Approach:	Butler Ave	1
Major St. Volume:	1469	
Minor St. Volume:	154	
Warrant Met?:	Yes	
	X	Y
Series 1	0	154
	1469	154
Series 2	1469	0
	1469	154

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
500	420	500	505	500	N/A
600	360	600	460	600	590
700	325	700	420	700	540
800	285	800	360	800	475
900	245	900	325	900	425
1000	200	1000	285	1000	370
1100	175	1100	250	1100	340
1200	150	1200	220	1200	285
1300	130	1300	190	1300	250
1400	120	1400	155	1400	220
1500	100	1500	145	1500	180
1600	100	1600	120	1600	170
1700	100	1700	100	1650	150
1800	100	1800	100	1800	150

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*



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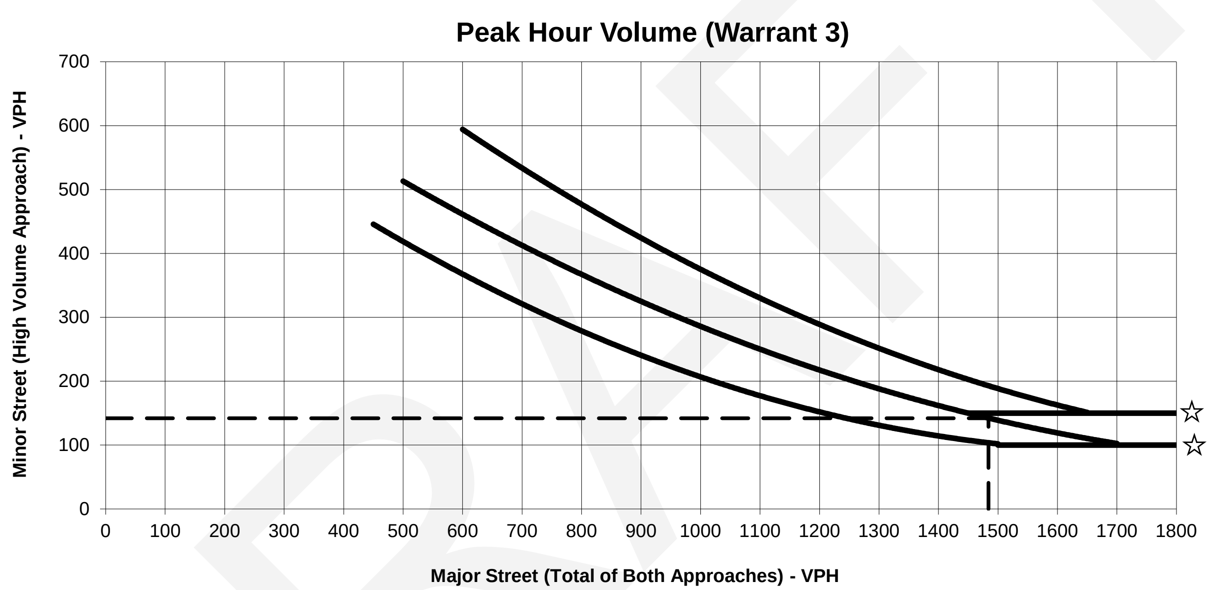
Scenario (AM/PM)	Existing + Project (PM) #3	
	Roadway	**Number of Lanes**
Major Approach:	Academy Ave	4
Minor Approach:	California Ave	1
Major St. Volume:	1466	
Minor St. Volume:	61	
Warrant Met?:	No	

	X	Y
Series 1	0	61
	1466	61
Series 2	1466	0
	1466	61

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
500	420	500	505	500	N/A
600	360	600	460	600	590
700	325	700	420	700	540
800	285	800	360	800	475
900	245	900	325	900	425
1000	200	1000	285	1000	370
1100	175	1100	250	1100	340
1200	150	1200	220	1200	285
1300	130	1300	190	1300	250
1400	120	1400	155	1400	220
1500	100	1500	145	1500	180
1600	100	1600	120	1600	170
1700	100	1700	100	1650	150
1800	100	1800	100	1800	150

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*



☆ NOTE:
150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Scenario (AM/PM)	Existing + Project (PM) #6	
	Roadway	**Number of Lanes**
Major Approach:	Academy Ave	4
Minor Approach:	Church Ave	1
Major St. Volume:	1484	
Minor St. Volume:	142	
Warrant Met?:	Yes	

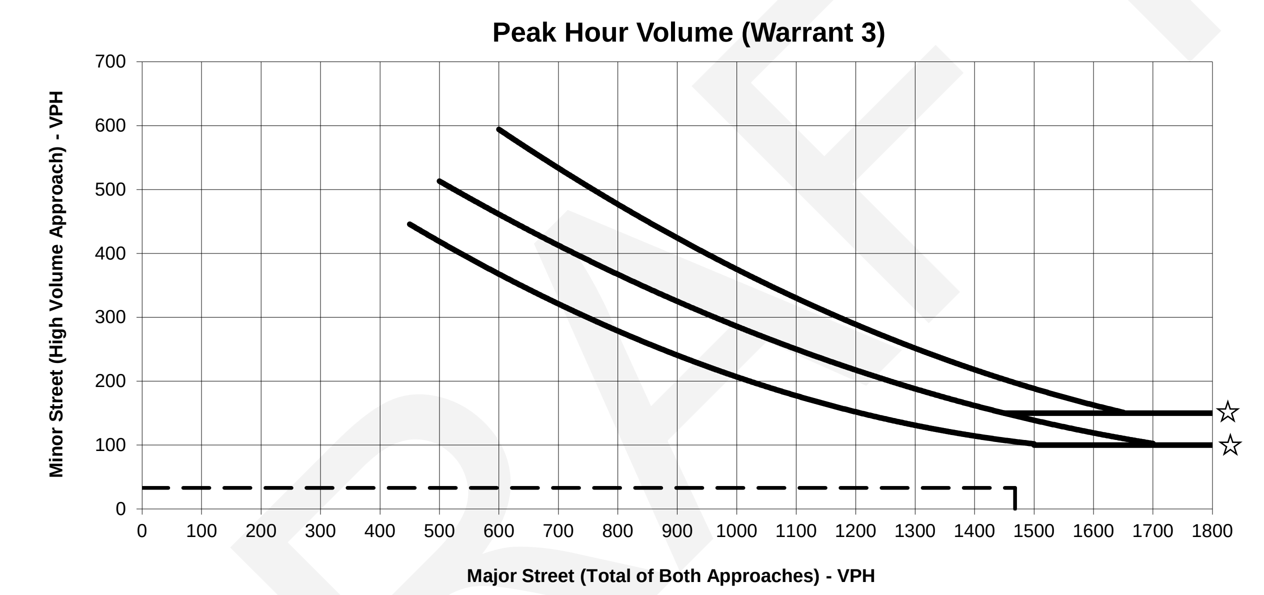
	X	Y
Series 1	0	142
	1484	142
Series 2	1484	0
	1484	142

Warrant Worksheets

Cumulative No Project Conditions

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
500	420	500	505	500	N/A
600	360	600	460	600	590
700	325	700	420	700	540
800	285	800	360	800	475
900	245	900	325	900	425
1000	200	1000	285	1000	370
1100	175	1100	250	1100	340
1200	150	1200	220	1200	285
1300	130	1300	190	1300	250
1400	120	1400	155	1400	220
1500	100	1500	145	1500	180
1600	100	1600	120	1600	170
1700	100	1700	100	1650	150
1800	100	1800	100	1800	150

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*

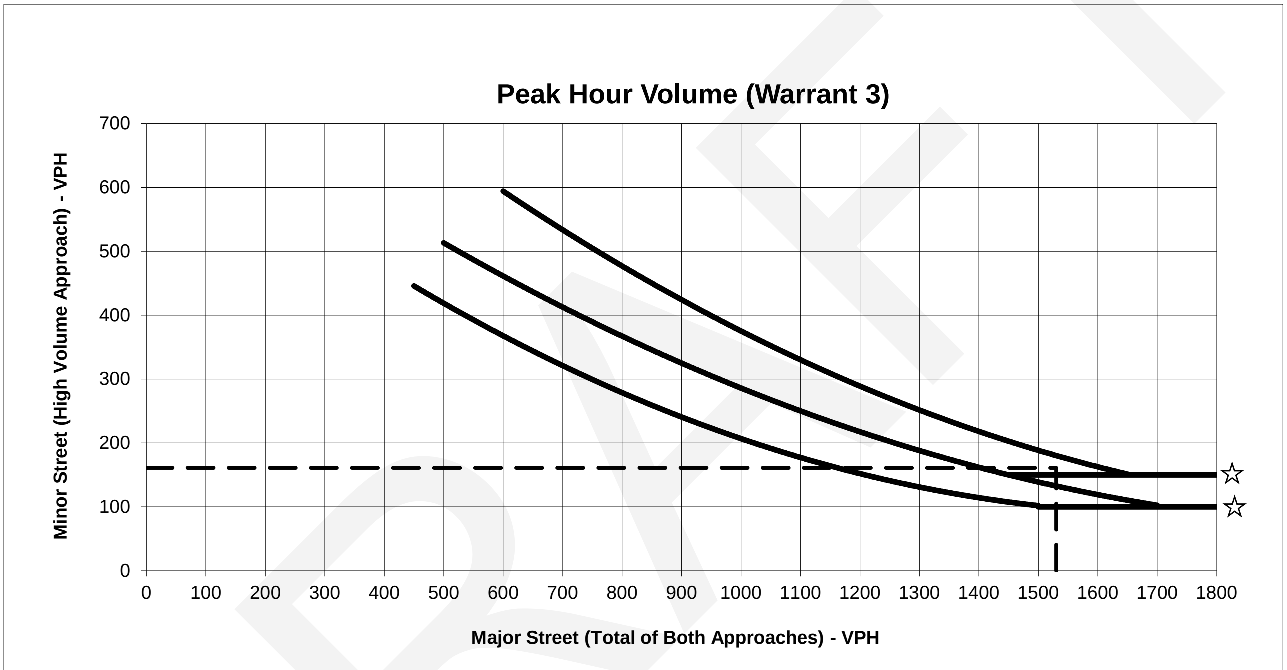


☆ NOTE:
150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Scenario (AM/PM)	Cumulative No-Project (AM) #2	
	Roadway	**Number of Lanes**
Major Approach:	Academy Ave	4
Minor Approach:	Butler Ave	1
Major St. Volume:	1468	
Minor St. Volume:	33	
Warrant Met?:	No	
	X	Y
Series 1	0	33
	1468	33
Series 2	1468	0
	1468	33

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
500	420	500	505	500	N/A
600	360	600	460	600	590
700	325	700	420	700	540
800	285	800	360	800	475
900	245	900	325	900	425
1000	200	1000	285	1000	370
1100	175	1100	250	1100	340
1200	150	1200	220	1200	285
1300	130	1300	190	1300	250
1400	120	1400	155	1400	220
1500	100	1500	145	1500	180
1600	100	1600	120	1600	170
1700	100	1700	100	1650	150
1800	100	1800	100	1800	150

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*



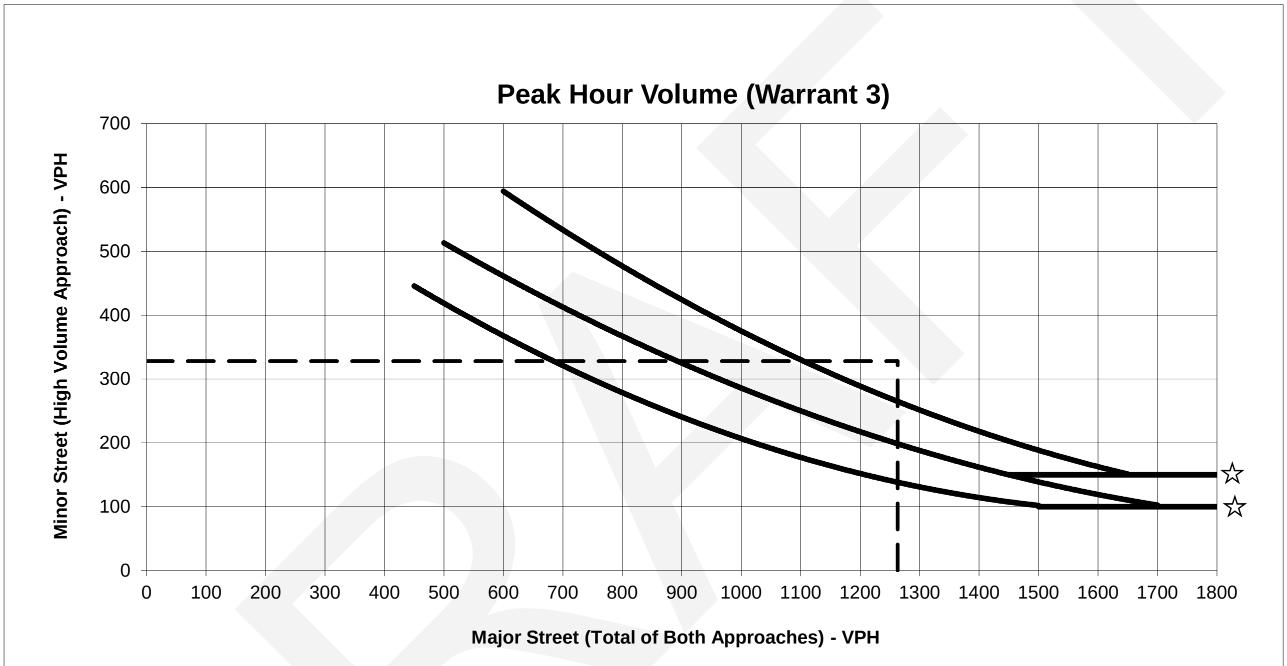
☆ NOTE:
150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Scenario (AM/PM)	Cumulative No-Project (AM) #2	
	Roadway	**Number of Lanes**
Major Approach:	Academy Ave	4
Minor Approach:	California Ave	1
Major St. Volume:	1530	
Minor St. Volume:	161	
Warrant Met?:	Yes	

	X	Y
Series 1	0	161
	1530	161
Series 2	1530	0
	1530	161

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
500	420	500	505	500	N/A
600	360	600	460	600	590
700	325	700	420	700	540
800	285	800	360	800	475
900	245	900	325	900	425
1000	200	1000	285	1000	370
1100	175	1100	250	1100	340
1200	150	1200	220	1200	285
1300	130	1300	190	1300	250
1400	120	1400	155	1400	220
1500	100	1500	145	1500	180
1600	100	1600	120	1600	170
1700	100	1700	100	1650	150
1800	100	1800	100	1800	150

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*



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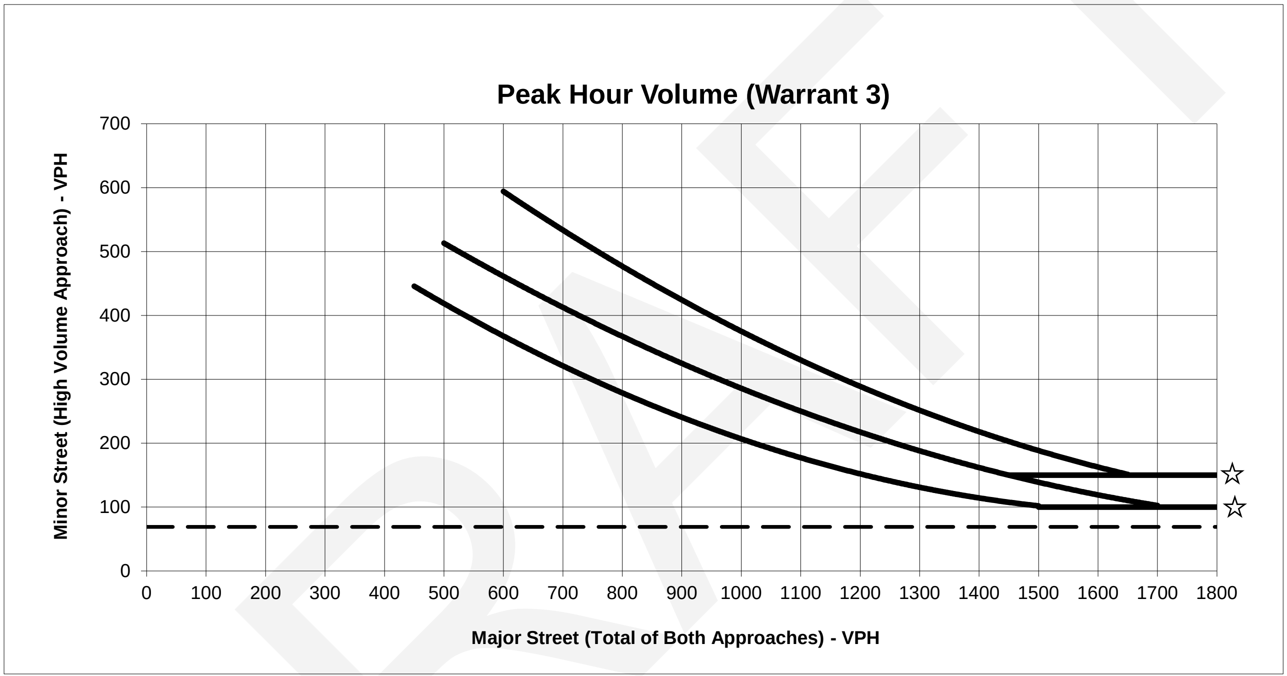
Scenario (AM/PM)	Cumulative No-Project (AM) #6	
	Roadway	**Number of Lanes**
Major Approach:	Academy Ave	4
Minor Approach:	Church Ave	1
Major St. Volume:	1263	
Minor St. Volume:	328	
Warrant Met?:	Yes	
	X	Y
Series 1	0	328
	1263	328
Series 2	1263	0
	1263	328

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
500	420	500	505	500	N/A
600	360	600	460	600	590
700	325	700	420	700	540
800	285	800	360	800	475
900	245	900	325	900	425
1000	200	1000	285	1000	370
1100	175	1100	250	1100	340
1200	150	1200	220	1200	285
1300	130	1300	190	1300	250
1400	120	1400	155	1400	220
1500	100	1500	145	1500	180
1600	100	1600	120	1600	170
1700	100	1700	100	1650	150
1800	100	1800	100	1800	150

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*

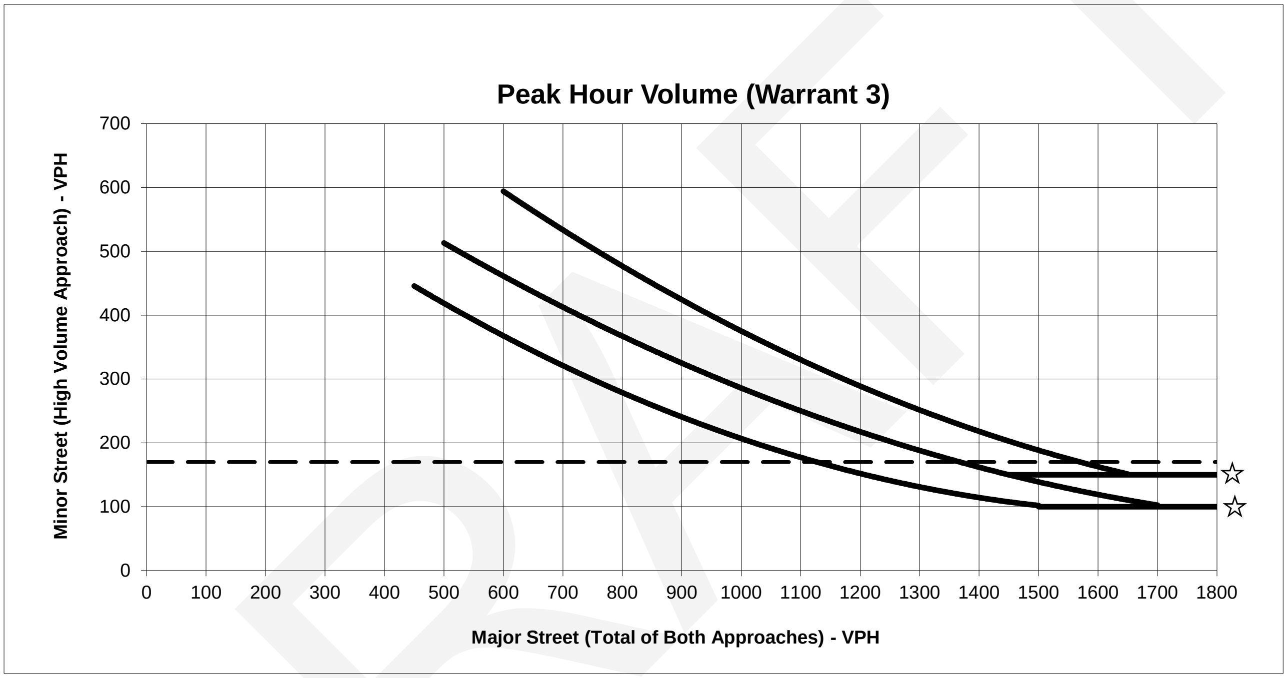


☆ NOTE:
150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Scenario (AM/PM)	Cumulative No-Project (PM) #2	
	Roadway	**Number of Lanes**
Major Approach:	Academy Ave	4
Minor Approach:	Butler Ave	1
Major St. Volume:	1978	
Minor St. Volume:	69	
Warrant Met?:	No	
	X	Y
Series 1	0	69
	1978	69
Series 2	1978	0
	1978	69

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
500	420	500	505	500	N/A
600	360	600	460	600	590
700	325	700	420	700	540
800	285	800	360	800	475
900	245	900	325	900	425
1000	200	1000	285	1000	370
1100	175	1100	250	1100	340
1200	150	1200	220	1200	285
1300	130	1300	190	1300	250
1400	120	1400	155	1400	220
1500	100	1500	145	1500	180
1600	100	1600	120	1600	170
1700	100	1700	100	1650	150
1800	100	1800	100	1800	150

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*



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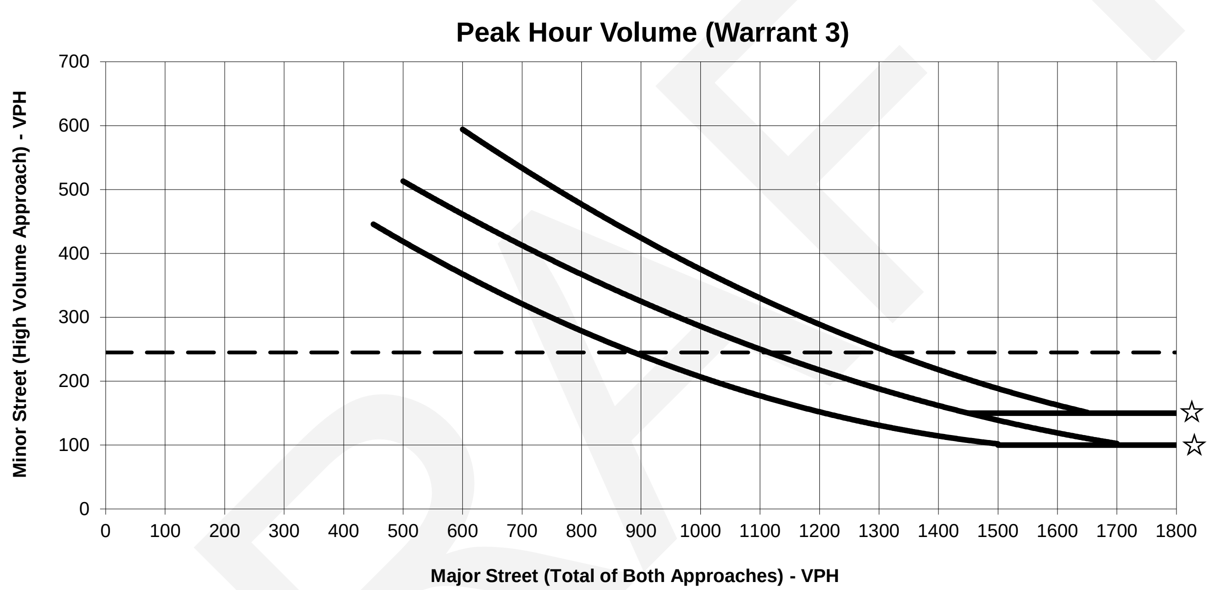
Scenario (AM/PM)	Cumulative No-Project (PM) #3	
	Roadway	**Number of Lanes**
Major Approach:	Academy Ave	4
Minor Approach:	California Ave	1
Major St. Volume:	2086	
Minor St. Volume:	170	
Warrant Met?:	Yes	
	X	Y
Series 1	0	170
	2086	170
Series 2	2086	0
	2086	170

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
500	420	500	505	500	N/A
600	360	600	460	600	590
700	325	700	420	700	540
800	285	800	360	800	475
900	245	900	325	900	425
1000	200	1000	285	1000	370
1100	175	1100	250	1100	340
1200	150	1200	220	1200	285
1300	130	1300	190	1300	250
1400	120	1400	155	1400	220
1500	100	1500	145	1500	180
1600	100	1600	120	1600	170
1700	100	1700	100	1650	150
1800	100	1800	100	1800	150

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*



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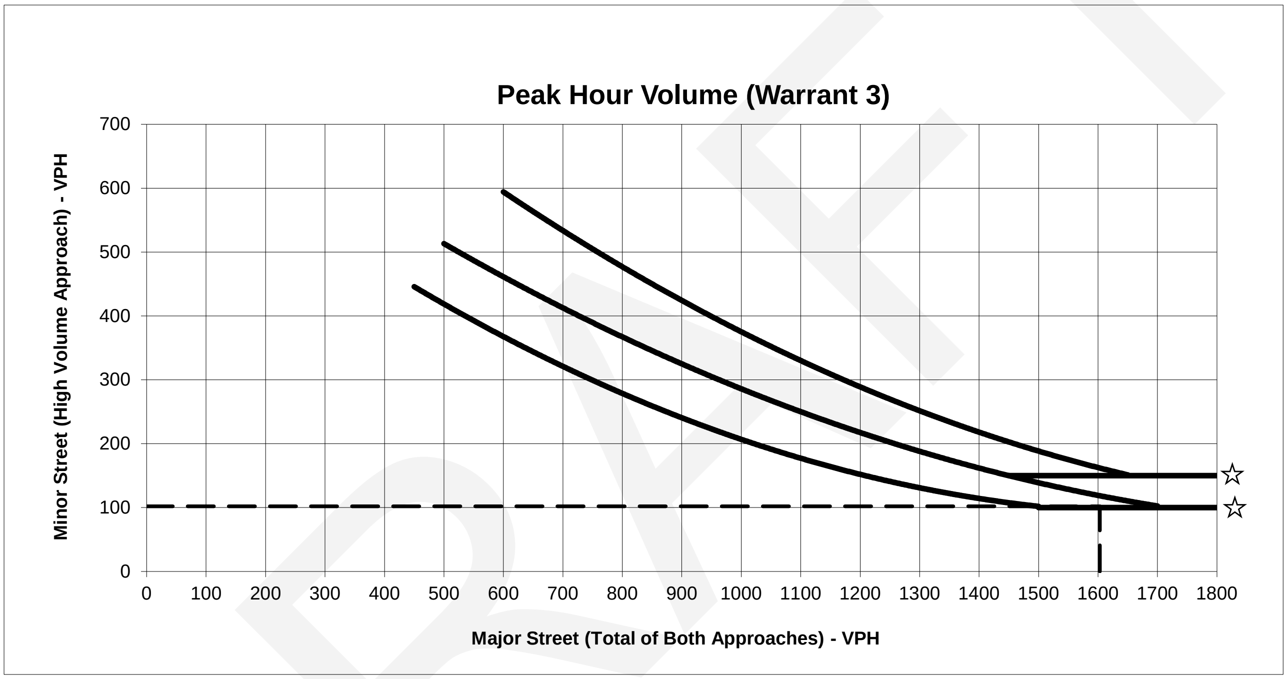
Scenario (AM/PM)	Cumulative No-Project (PM) #6	
	Roadway	**Number of Lanes**
Major Approach:	Academy Ave	4
Minor Approach:	Church Ave	1
Major St. Volume:	1983	
Minor St. Volume:	245	
Warrant Met?:	Yes	
	X	Y
Series 1	0	245
	1983	245
Series 2	1983	0
	1983	245

Warrant Worksheets

Cumulative plus Project Conditions

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
500	420	500	505	500	N/A
600	360	600	460	600	590
700	325	700	420	700	540
800	285	800	360	800	475
900	245	900	325	900	425
1000	200	1000	285	1000	370
1100	175	1100	250	1100	340
1200	150	1200	220	1200	285
1300	130	1300	190	1300	250
1400	120	1400	155	1400	220
1500	100	1500	145	1500	180
1600	100	1600	120	1600	170
1700	100	1700	100	1650	150
1800	100	1800	100	1800	150

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*



☆ NOTE:
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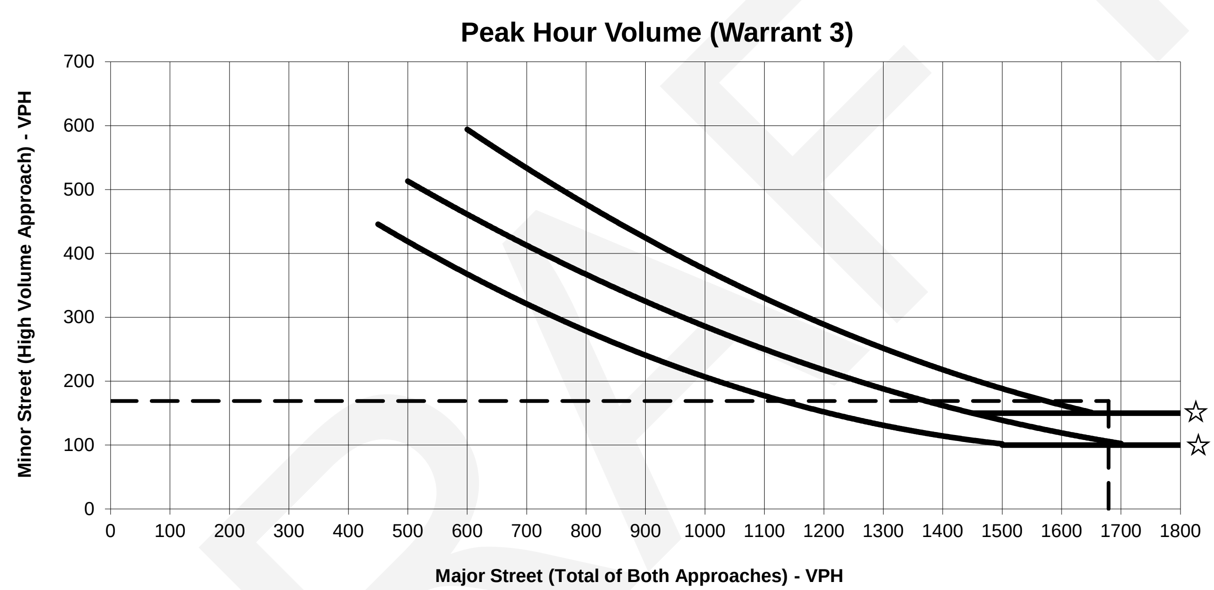
Scenario (AM/PM)	Cumulative plus Project (AM) #2	
	Roadway	**Number of Lanes**
Major Approach:	Academy Ave	4
Minor Approach:	Butler Ave	1
Major St. Volume:	1603	
Minor St. Volume:	102	
Warrant Met?:	No	
	X	Y
Series 1	0	102
	1603	102
Series 2	1603	0
	1603	102

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
500	420	500	505	500	N/A
600	360	600	460	600	590
700	325	700	420	700	540
800	285	800	360	800	475
900	245	900	325	900	425
1000	200	1000	285	1000	370
1100	175	1100	250	1100	340
1200	150	1200	220	1200	285
1300	130	1300	190	1300	250
1400	120	1400	155	1400	220
1500	100	1500	145	1500	180
1600	100	1600	120	1600	170
1700	100	1700	100	1650	150
1800	100	1800	100	1800	150

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*



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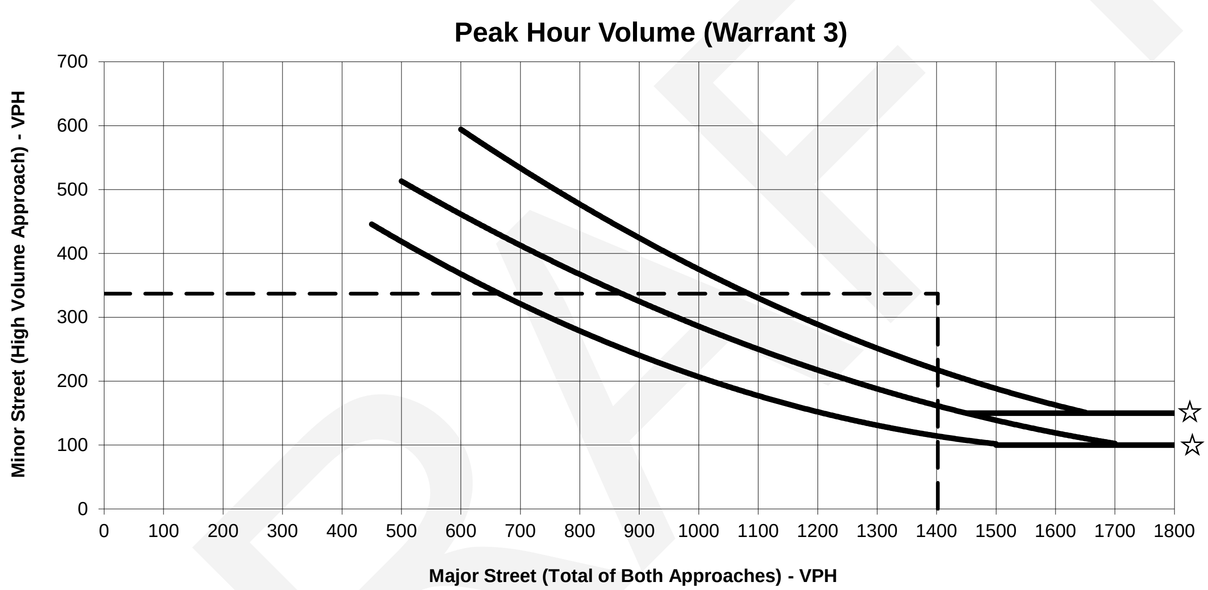
150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Scenario (AM/PM)	Cumulative plus Project (AM) #3	
	Roadway	**Number of Lanes**
Major Approach:	Academy Ave	4
Minor Approach:	California Ave	1
Major St. Volume:	1679	
Minor St. Volume:	169	
Warrant Met?:	Yes	
	X	Y
Series 1	0	169
	1679	169
Series 2	1679	0
	1679	169

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
500	420	500	505	500	N/A
600	360	600	460	600	590
700	325	700	420	700	540
800	285	800	360	800	475
900	245	900	325	900	425
1000	200	1000	285	1000	370
1100	175	1100	250	1100	340
1200	150	1200	220	1200	285
1300	130	1300	190	1300	250
1400	120	1400	155	1400	220
1500	100	1500	145	1500	180
1600	100	1600	120	1600	170
1700	100	1700	100	1650	150
1800	100	1800	100	1800	150

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*



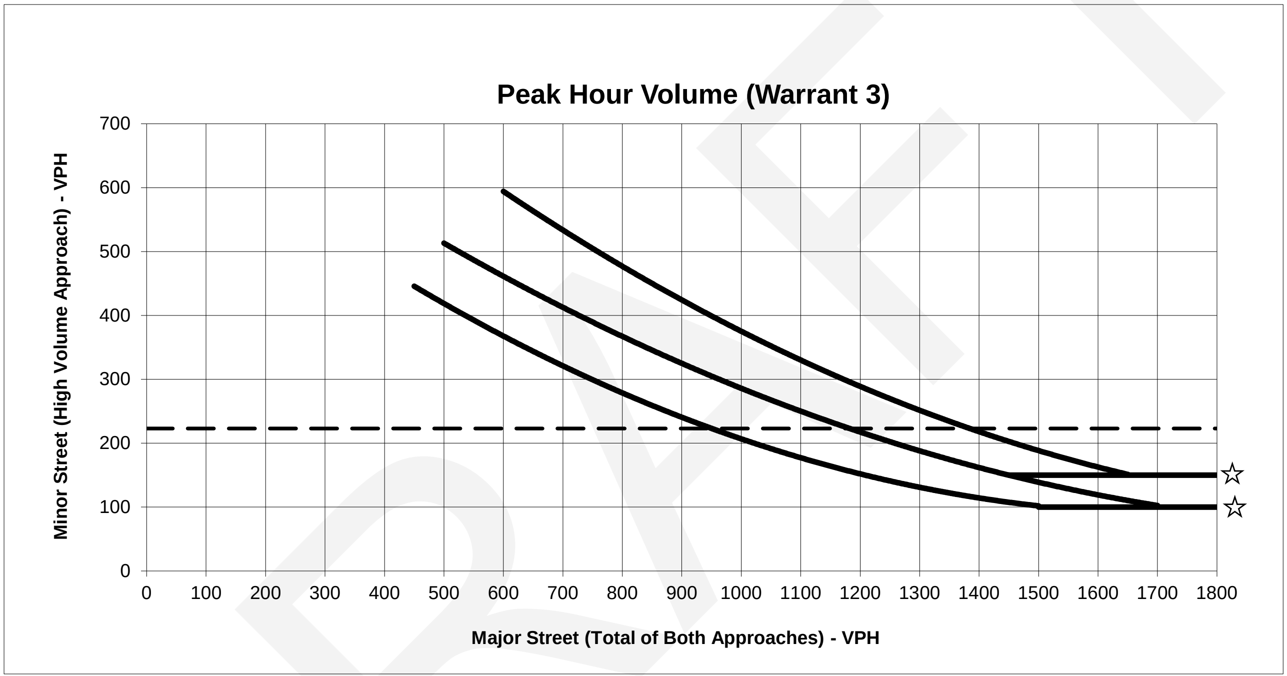
☆ NOTE:
150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Scenario (AM/PM)	Cumulative plus Project (AM) #6	
	Roadway	**Number of Lanes**
Major Approach:	Academy Ave	4
Minor Approach:	Church Ave	1
Major St. Volume:	1402	
Minor St. Volume:	337	
Warrant Met?:	Yes	

	X	Y
Series 1	0	337
	1402	337
Series 2	1402	0
	1402	337

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
500	420	500	505	500	N/A
600	360	600	460	600	590
700	325	700	420	700	540
800	285	800	360	800	475
900	245	900	325	900	425
1000	200	1000	285	1000	370
1100	175	1100	250	1100	340
1200	150	1200	220	1200	285
1300	130	1300	190	1300	250
1400	120	1400	155	1400	220
1500	100	1500	145	1500	180
1600	100	1600	120	1600	170
1700	100	1700	100	1650	150
1800	100	1800	100	1800	150

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*

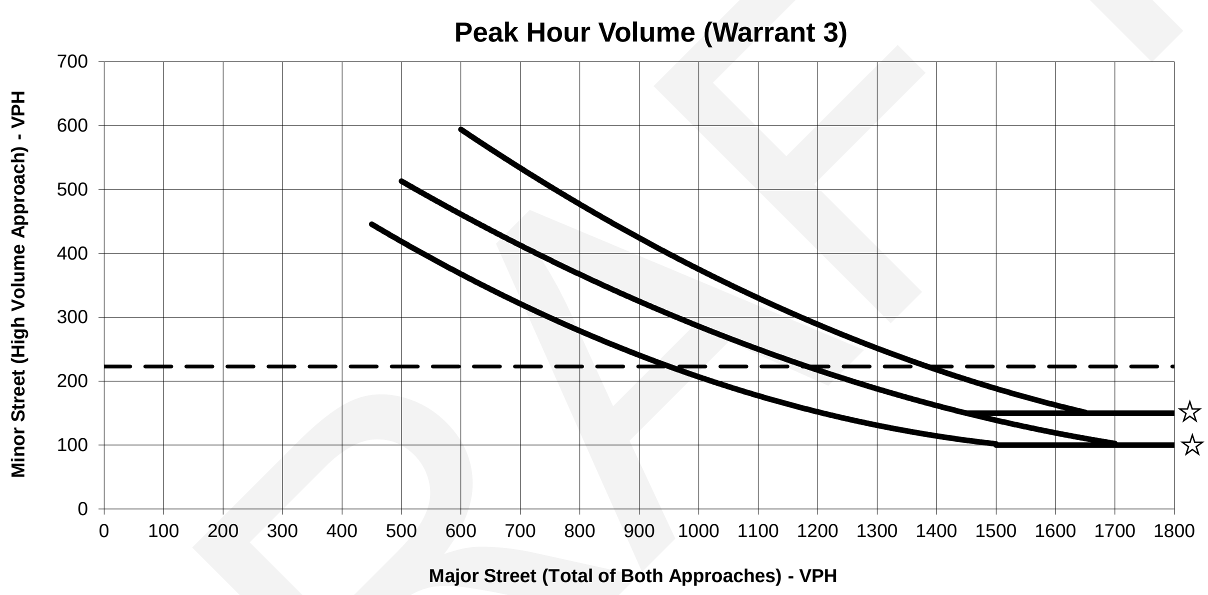


☆ NOTE:
150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Scenario (AM/PM)	Cumulative plus Project (PM) #2	
	Roadway	**Number of Lanes**
Major Approach:	Academy Ave	4
Minor Approach:	Butler Ave	1
Major St. Volume:	2380	
Minor St. Volume:	223	
Warrant Met?:	Yes	
	X	Y
Series 1	0	223
	2380	223
Series 2	2380	0
	2380	223

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
500	420	500	505	500	N/A
600	360	600	460	600	590
700	325	700	420	700	540
800	285	800	360	800	475
900	245	900	325	900	425
1000	200	1000	285	1000	370
1100	175	1100	250	1100	340
1200	150	1200	220	1200	285
1300	130	1300	190	1300	250
1400	120	1400	155	1400	220
1500	100	1500	145	1500	180
1600	100	1600	120	1600	170
1700	100	1700	100	1650	150
1800	100	1800	100	1800	150

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*



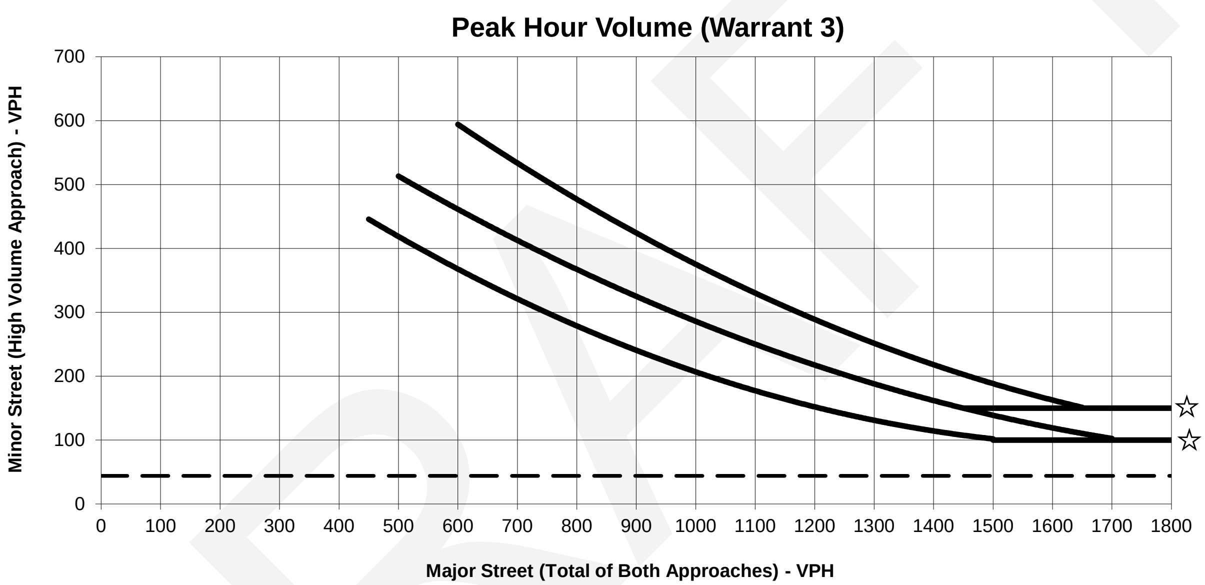
☆ NOTE:
150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Scenario (AM/PM)	Cumulative plus Project (PM) #3	
	Roadway	**Number of Lanes**
Major Approach:	Academy Ave	4
Minor Approach:	California Ave	1
Major St. Volume:	2492	
Minor St. Volume:	223	
Warrant Met?:	Yes	

	X	Y
Series 1	0	223
	2492	223
Series 2	2492	0
	2492	223

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
500	420	500	505	500	N/A
600	360	600	460	600	590
700	325	700	420	700	540
800	285	800	360	800	475
900	245	900	325	900	425
1000	200	1000	285	1000	370
1100	175	1100	250	1100	340
1200	150	1200	220	1200	285
1300	130	1300	190	1300	250
1400	120	1400	155	1400	220
1500	100	1500	145	1500	180
1600	100	1600	120	1600	170
1700	100	1700	100	1650	150
1800	100	1800	100	1800	150

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*



☆ NOTE:
150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Scenario (AM/PM)	Cumulative plus Project (PM) #5

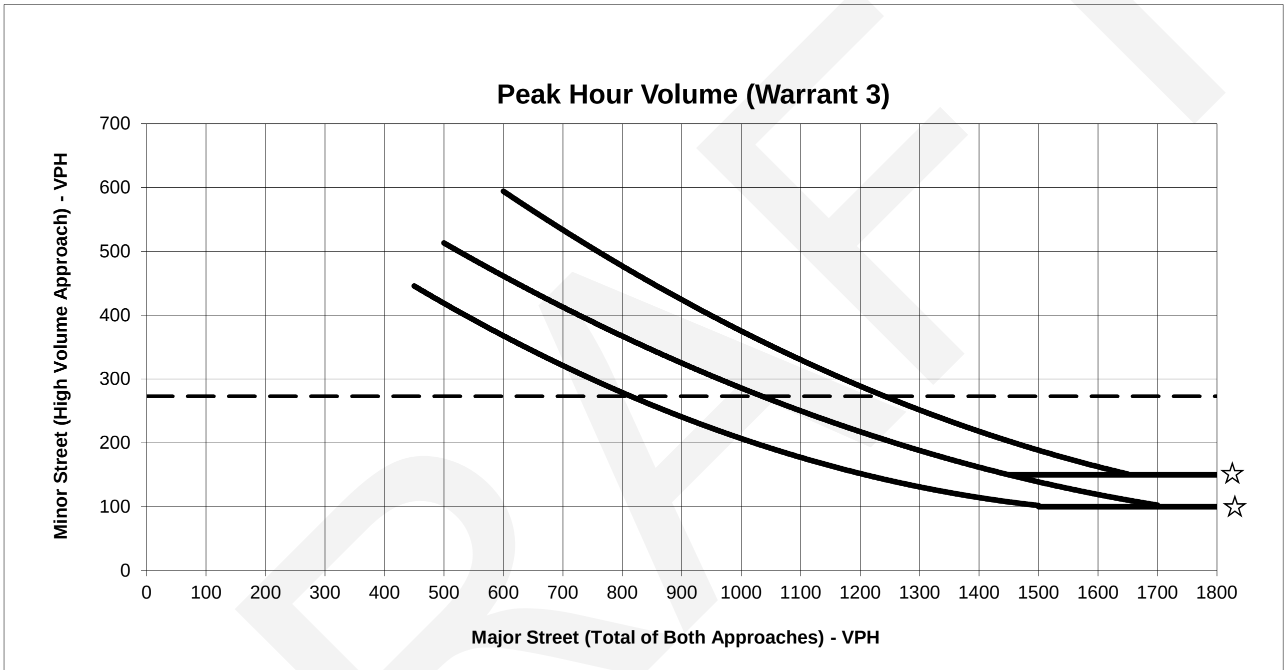
	Roadway	Number of Lanes
Major Approach:	Academy Ave	4
Minor Approach:	Florence Ave	1

Major St. Volume:	2414	
Minor St. Volume:	44	
Warrant Met?:	No	

	X	Y
Series 1	0	44
	2414	44
Series 2	2414	0
	2414	44

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
500	420	500	505	500	N/A
600	360	600	460	600	590
700	325	700	420	700	540
800	285	800	360	800	475
900	245	900	325	900	425
1000	200	1000	285	1000	370
1100	175	1100	250	1100	340
1200	150	1200	220	1200	285
1300	130	1300	190	1300	250
1400	120	1400	155	1400	220
1500	100	1500	145	1500	180
1600	100	1600	120	1600	170
1700	100	1700	100	1650	150
1800	100	1800	100	1800	150

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*



☆ NOTE:
150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Scenario (AM/PM)	Cumulative plus Project (PM) #6	
	Roadway	**Number of Lanes**
Major Approach:	Academy Ave	4
Minor Approach:	Church Ave	1
Major St. Volume:	2353	
Minor St. Volume:	273	
Warrant Met?:	Yes	

	X	Y
Series 1	0	273
	2353	273
Series 2	2353	0
	2353	273

MITIGATION

Mitigation Worksheets

Existing plus Project Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↱		↰	↑↱	
Traffic Volume (veh/h)	81	2	71	8	3	14	76	605	11	11	681	85
Future Volume (veh/h)	81	2	71	8	3	14	76	605	11	11	681	85
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	90	2	79	9	3	16	84	672	12	12	757	94
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, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	162	13	98	104	48	132	577	2739	49	619	2439	303
Arrive On Green	0.14	0.14	0.14	0.14	0.14	0.14	0.76	0.76	0.76	1.00	1.00	1.00
Sat Flow, veh/h	728	90	702	366	347	950	653	3600	64	763	3206	398
Grp Volume(v), veh/h	171	0	0	28	0	0	84	334	350	12	423	428
Grp Sat Flow(s),veh/h/ln	1520	0	0	1663	0	0	653	1791	1874	763	1791	1814
Q Serve(g_s), s	8.5	0.0	0.0	0.0	0.0	0.0	3.2	4.9	4.9	0.1	0.0	0.0
Cycle Q Clear(g_c), s	9.8	0.0	0.0	1.3	0.0	0.0	3.2	4.9	4.9	5.0	0.0	0.0
Prop In Lane	0.53		0.46	0.32		0.57	1.00		0.03	1.00		0.22
Lane Grp Cap(c), veh/h	273	0	0	284	0	0	577	1363	1425	619	1363	1380
V/C Ratio(X)	0.63	0.00	0.00	0.10	0.00	0.00	0.15	0.25	0.25	0.02	0.31	0.31
Avail Cap(c_a), veh/h	554	0	0	572	0	0	577	1363	1425	619	1363	1380
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.91	0.91	0.91
Uniform Delay (d), s/veh	37.5	0.0	0.0	33.9	0.0	0.0	3.0	3.2	3.2	0.2	0.0	0.0
Incr Delay (d2), s/veh	2.4	0.0	0.0	0.1	0.0	0.0	0.5	0.4	0.4	0.1	0.5	0.5
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	3.8	0.0	0.0	0.5	0.0	0.0	0.3	1.3	1.3	0.0	0.2	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.8	0.0	0.0	34.0	0.0	0.0	3.5	3.6	3.6	0.2	0.5	0.5
LnGrp LOS	D	A	A	C	A	A	A	A	A	A	A	A
Approach Vol, veh/h		171			28			768			863	
Approach Delay, s/veh		39.8			34.0			3.6			0.5	
Approach LOS		D			C			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		73.0		17.0		73.0		17.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		51.5		29.5		51.5		29.5				
Max Q Clear Time (g_c+I1), s		6.9		11.8		7.0		3.3				
Green Ext Time (p_c), s		5.3		0.9		5.2		0.1				
Intersection Summary												
HCM 6th Ctrl Delay			6.0									
HCM 6th LOS			A									

Intersection	
Intersection Delay, s/veh	24.6
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	1	35	23	1	37	36	646	25	24	718	17
Future Vol, veh/h	17	1	35	23	1	37	36	646	25	24	718	17
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, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	19	1	38	25	1	41	40	710	27	26	789	19
Number of Lanes	0	1	0	0	1	0	1	2	0	1	2	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	1	1
HCM Control Delay	11.6	11.8	22.5	28.4
HCM LOS	B	B	C	D

Lane	NBLn1	NBLn2	NBLn3	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	0%	32%	38%	100%	0%	0%
Vol Thru, %	0%	100%	90%	2%	2%	0%	100%	93%
Vol Right, %	0%	0%	10%	66%	61%	0%	0%	7%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	36	431	240	53	61	24	479	256
LT Vol	36	0	0	17	23	24	0	0
Through Vol	0	431	215	1	1	0	479	239
RT Vol	0	0	25	35	37	0	0	17
Lane Flow Rate	40	473	264	58	67	26	526	282
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.072	0.797	0.439	0.124	0.144	0.048	0.876	0.465
Departure Headway (Hd)	6.566	6.061	5.987	7.676	7.709	6.499	5.994	5.947
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	544	596	600	465	463	549	605	603
Service Time	4.327	3.822	3.748	5.46	5.49	4.257	3.751	3.704
HCM Lane V/C Ratio	0.074	0.794	0.44	0.125	0.145	0.047	0.869	0.468
HCM Control Delay	9.8	28.6	13.4	11.6	11.8	9.6	37.1	13.8
HCM Lane LOS	A	D	B	B	B	A	E	B
HCM 95th-tile Q	0.2	7.8	2.2	0.4	0.5	0.2	10.1	2.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	38	104	622	76	172	614
Future Volume (veh/h)	38	104	622	76	172	614
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1900	1900	1885	1885	1885	1885
Adj Flow Rate, veh/h	40	111	662	81	183	653
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	0	0	1	1	1	1
Cap, veh/h	53	146	1863	228	579	2077
Arrive On Green	0.12	0.12	0.58	0.58	0.58	0.58
Sat Flow, veh/h	433	1203	3307	393	723	3676
Grp Volume(v), veh/h	152	0	369	374	183	653
Grp Sat Flow(s),veh/h/ln	1647	0	1791	1815	723	1791
Q Serve(g_s), s	2.7	0.0	3.3	3.3	5.4	2.8
Cycle Q Clear(g_c), s	2.7	0.0	3.3	3.3	8.7	2.8
Prop In Lane	0.26	0.73		0.22	1.00	
Lane Grp Cap(c), veh/h	200	0	1039	1052	579	2077
V/C Ratio(X)	0.76	0.00	0.35	0.36	0.32	0.31
Avail Cap(c_a), veh/h	1121	0	3598	3646	1612	7197
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	12.8	0.0	3.3	3.3	5.6	3.2
Incr Delay (d2), s/veh	5.9	0.0	0.2	0.2	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	0.1	0.1	0.3	0.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	18.7	0.0	3.6	3.6	6.0	3.3
LnGrp LOS	B	A	A	A	A	A
Approach Vol, veh/h	152		743			836
Approach Delay, s/veh	18.7		3.6			3.9
Approach LOS	B		A			A

Timer - Assigned Phs	2	6	8
Phs Duration (G+Y+Rc), s	22.0	22.0	8.1
Change Period (Y+Rc), s	4.5	4.5	4.5
Max Green Setting (Gmax), s	60.5	60.5	20.5
Max Q Clear Time (g_c+I1), s	5.3	10.7	4.7
Green Ext Time (p_c), s	4.9	6.8	0.4

Intersection Summary	
HCM 6th Ctrl Delay	5.1
HCM 6th LOS	A

Mitigation Worksheets

Cumulative No Project Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↑↱		↰	↑↱	
Traffic Volume (veh/h)	21	13	35	12	21	20	19	1007	21	17	902	12
Future Volume (veh/h)	21	13	35	12	21	20	19	1007	21	17	902	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	23	14	38	13	23	22	21	1095	23	18	980	13
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, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	212	42	94	187	86	73	487	2057	43	446	2075	28
Arrive On Green	0.11	0.11	0.11	0.11	0.11	0.11	0.57	0.57	0.57	0.57	0.57	0.57
Sat Flow, veh/h	428	373	822	300	752	643	572	3587	75	508	3619	48
Grp Volume(v), veh/h	75	0	0	58	0	0	21	547	571	18	485	508
Grp Sat Flow(s),veh/h/ln	1623	0	0	1695	0	0	572	1791	1872	508	1791	1877
Q Serve(g_s), s	0.3	0.0	0.0	0.0	0.0	0.0	0.6	5.4	5.4	0.6	4.6	4.6
Cycle Q Clear(g_c), s	1.2	0.0	0.0	0.9	0.0	0.0	5.2	5.4	5.4	6.0	4.6	4.6
Prop In Lane	0.31		0.51	0.22		0.38	1.00		0.04	1.00		0.03
Lane Grp Cap(c), veh/h	348	0	0	346	0	0	487	1027	1073	446	1027	1076
V/C Ratio(X)	0.22	0.00	0.00	0.17	0.00	0.00	0.04	0.53	0.53	0.04	0.47	0.47
Avail Cap(c_a), veh/h	1393	0	0	1438	0	0	1322	3642	3806	1188	3642	3816
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	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	11.8	0.0	0.0	11.7	0.0	0.0	5.1	3.8	3.8	5.6	3.6	3.6
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.2	0.0	0.0	0.0	0.4	0.4	0.0	0.3	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	0.4	0.0	0.0	0.3	0.0	0.0	0.0	0.2	0.2	0.0	0.1	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.1	0.0	0.0	11.9	0.0	0.0	5.1	4.2	4.2	5.7	3.9	3.9
LnGrp LOS	B	A	A	B	A	A	A	A	A	A	A	A
Approach Vol, veh/h		75			58			1139			1011	
Approach Delay, s/veh		12.1			11.9			4.2			4.0	
Approach LOS		B			B			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		21.0		7.8		21.0		7.8				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		58.5		22.5		58.5		22.5				
Max Q Clear Time (g_c+I1), s		7.4		3.2		8.0		2.9				
Green Ext Time (p_c), s		9.1		0.3		6.6		0.2				
Intersection Summary												
HCM 6th Ctrl Delay			4.5									
HCM 6th LOS			A									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↱		↰	↑↑	
Traffic Volume (veh/h)	54	23	93	38	55	53	80	971	52	38	896	49
Future Volume (veh/h)	54	23	93	38	55	53	80	971	52	38	896	49
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	59	25	101	41	60	58	87	1055	57	41	974	53
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, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	78	33	133	55	81	78	292	1722	93	267	1721	94
Arrive On Green	0.14	0.14	0.14	0.12	0.12	0.12	0.50	0.50	0.50	0.50	0.50	0.50
Sat Flow, veh/h	540	229	924	451	660	638	554	3456	187	511	3454	188
Grp Volume(v), veh/h	185	0	0	159	0	0	87	547	565	41	505	522
Grp Sat Flow(s),veh/h/ln	1692	0	0	1748	0	0	554	1791	1852	511	1791	1851
Q Serve(g_s), s	6.0	0.0	0.0	5.0	0.0	0.0	7.5	12.7	12.7	3.6	11.3	11.3
Cycle Q Clear(g_c), s	6.0	0.0	0.0	5.0	0.0	0.0	18.8	12.7	12.7	16.3	11.3	11.3
Prop In Lane	0.32		0.55	0.26		0.36	1.00		0.10	1.00		0.10
Lane Grp Cap(c), veh/h	244	0	0	214	0	0	292	892	923	267	892	923
V/C Ratio(X)	0.76	0.00	0.00	0.74	0.00	0.00	0.30	0.61	0.61	0.15	0.57	0.57
Avail Cap(c_a), veh/h	545	0	0	548	0	0	402	1248	1290	369	1248	1290
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	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.6	0.0	0.0	24.3	0.0	0.0	16.6	10.4	10.4	16.3	10.1	10.1
Incr Delay (d2), s/veh	4.8	0.0	0.0	5.1	0.0	0.0	0.6	0.7	0.7	0.3	0.6	0.5
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	2.6	0.0	0.0	2.2	0.0	0.0	0.9	3.8	4.0	0.4	3.4	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.4	0.0	0.0	29.4	0.0	0.0	17.2	11.1	11.1	16.5	10.6	10.6
LnGrp LOS	C	A	A	C	A	A	B	B	B	B	B	B
Approach Vol, veh/h		185			159			1199			1068	
Approach Delay, s/veh		28.4			29.4			11.5			10.8	
Approach LOS		C			C			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		33.1		12.8		33.1		11.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		40.0		18.5		40.0		18.0				
Max Q Clear Time (g_c+I1), s		20.8		8.0		18.3		7.0				
Green Ext Time (p_c), s		7.8		0.7		7.1		0.6				
Intersection Summary												
HCM 6th Ctrl Delay			13.5									
HCM 6th LOS			B									

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	82	163	839	139	221	784
Future Volume (veh/h)	82	163	839	139	221	784
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1900	1900	1885	1885	1885	1885
Adj Flow Rate, veh/h	89	177	912	151	240	852
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	1	1	1	1
Cap, veh/h	105	209	2087	345	396	2430
Arrive On Green	0.19	0.19	0.68	0.68	0.68	0.68
Sat Flow, veh/h	553	1100	3170	509	535	3676
Grp Volume(v), veh/h	267	0	531	532	240	852
Grp Sat Flow(s),veh/h/ln	1660	0	1791	1794	535	1791
Q Serve(g_s), s	10.6	0.0	9.2	9.2	25.4	6.8
Cycle Q Clear(g_c), s	10.6	0.0	9.2	9.2	34.6	6.8
Prop In Lane	0.33	0.66		0.28	1.00	
Lane Grp Cap(c), veh/h	315	0	1215	1217	396	2430
V/C Ratio(X)	0.85	0.00	0.44	0.44	0.61	0.35
Avail Cap(c_a), veh/h	438	0	1654	1656	527	3308
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	26.7	0.0	5.0	5.0	12.9	4.6
Incr Delay (d2), s/veh	10.8	0.0	0.2	0.2	1.5	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.0	0.0	2.2	2.2	2.5	1.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	37.5	0.0	5.3	5.3	14.4	4.7
LnGrp LOS	D	A	A	A	B	A
Approach Vol, veh/h	267		1063			1092
Approach Delay, s/veh	37.5		5.3			6.8
Approach LOS	D		A			A

Timer - Assigned Phs	2	6	8
Phs Duration (G+Y+Rc), s	50.8	50.8	17.4
Change Period (Y+Rc), s	4.5	4.5	4.5
Max Green Setting (Gmax), s	63.0	63.0	18.0
Max Q Clear Time (g_c+I1), s	11.2	36.6	12.6
Green Ext Time (p_c), s	8.2	9.7	0.4

Intersection Summary	
HCM 6th Ctrl Delay	9.5
HCM 6th LOS	A

Mitigation Worksheets

Cumulative plus Project Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	102	15	106	13	24	22	95	1129	22	19	1018	97
Future Volume (veh/h)	102	15	106	13	24	22	95	1129	22	19	1018	97
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	111	16	115	14	26	24	103	1227	24	21	1107	105
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, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	224	41	149	123	184	134	339	2241	44	329	2062	195
Arrive On Green	0.21	0.21	0.21	0.21	0.21	0.21	0.62	0.62	0.62	0.62	0.62	0.62
Sat Flow, veh/h	603	202	729	193	897	654	465	3593	70	448	3306	313
Grp Volume(v), veh/h	242	0	0	64	0	0	103	611	640	21	599	613
Grp Sat Flow(s),veh/h/ln	1533	0	0	1744	0	0	465	1791	1873	448	1791	1829
Q Serve(g_s), s	6.2	0.0	0.0	0.0	0.0	0.0	8.5	10.3	10.3	1.5	9.9	10.0
Cycle Q Clear(g_c), s	7.7	0.0	0.0	1.6	0.0	0.0	18.4	10.3	10.3	11.7	9.9	10.0
Prop In Lane	0.46		0.48	0.22		0.37	1.00		0.04	1.00		0.17
Lane Grp Cap(c), veh/h	414	0	0	441	0	0	339	1117	1168	329	1117	1141
V/C Ratio(X)	0.58	0.00	0.00	0.15	0.00	0.00	0.30	0.55	0.55	0.06	0.54	0.54
Avail Cap(c_a), veh/h	765	0	0	818	0	0	561	1973	2063	543	1973	2015
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	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.6	0.0	0.0	17.2	0.0	0.0	10.8	5.7	5.7	9.0	5.6	5.6
Incr Delay (d2), s/veh	1.3	0.0	0.0	0.1	0.0	0.0	0.5	0.4	0.4	0.1	0.4	0.4
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	2.6	0.0	0.0	0.6	0.0	0.0	0.7	2.1	2.2	0.1	1.5	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.9	0.0	0.0	17.4	0.0	0.0	11.3	6.1	6.1	9.1	6.0	6.0
LnGrp LOS	C	A	A	B	A	A	B	A	A	A	A	A
Approach Vol, veh/h		242			64			1354			1233	
Approach Delay, s/veh		20.9			17.4			6.5			6.0	
Approach LOS		C			B			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		37.3		15.3		37.3		15.3				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		57.9		23.1		57.9		23.1				
Max Q Clear Time (g_c+I1), s		20.4		9.7		13.7		3.6				
Green Ext Time (p_c), s		12.3		1.2		9.1		0.2				
Intersection Summary												
HCM 6th Ctrl Delay			7.7									
HCM 6th LOS			A									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	71	24	128	38	56	58	116	1151	52	42	1065	66
Future Volume (veh/h)	71	24	128	38	56	58	116	1151	52	42	1065	66
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	77	26	139	41	61	63	126	1251	57	46	1158	72
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	92	31	167	53	78	81	226	1849	84	207	1815	113
Arrive On Green	0.17	0.17	0.17	0.12	0.12	0.12	0.53	0.53	0.53	0.53	0.53	0.53
Sat Flow, veh/h	536	181	967	433	645	666	457	3489	159	424	3425	213
Grp Volume(v), veh/h	242	0	0	165	0	0	126	642	666	46	605	625
Grp Sat Flow(s),veh/h/ln	1684	0	0	1744	0	0	457	1791	1857	424	1791	1847
Q Serve(g_s), s	10.6	0.0	0.0	7.0	0.0	0.0	20.7	20.1	20.1	6.8	18.3	18.4
Cycle Q Clear(g_c), s	10.6	0.0	0.0	7.0	0.0	0.0	39.1	20.1	20.1	26.9	18.3	18.4
Prop In Lane	0.32		0.57	0.25		0.38	1.00		0.09	1.00		0.12
Lane Grp Cap(c), veh/h	290	0	0	211	0	0	226	949	984	207	949	979
V/C Ratio(X)	0.83	0.00	0.00	0.78	0.00	0.00	0.56	0.68	0.68	0.22	0.64	0.64
Avail Cap(c_a), veh/h	397	0	0	411	0	0	226	949	984	207	949	979
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	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.6	0.0	0.0	32.6	0.0	0.0	26.6	13.2	13.2	23.1	12.8	12.8
Incr Delay (d2), s/veh	10.6	0.0	0.0	6.2	0.0	0.0	3.0	1.9	1.9	0.5	1.4	1.4
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	5.0	0.0	0.0	3.2	0.0	0.0	2.2	7.1	7.4	0.7	6.4	6.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	41.2	0.0	0.0	38.7	0.0	0.0	29.6	15.1	15.0	23.6	14.2	14.2
LnGrp LOS	D	A	A	D	A	A	C	B	B	C	B	B
Approach Vol, veh/h		242			165			1434			1276	
Approach Delay, s/veh		41.2			38.7			16.3			14.5	
Approach LOS		D			D			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		45.0		17.7		45.0		13.8				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		40.5		18.0		40.5		18.0				
Max Q Clear Time (g_c+I1), s		41.1		12.6		28.9		9.0				
Green Ext Time (p_c), s		0.0		0.6		6.3		0.5				
Intersection Summary												
HCM 6th Ctrl Delay			18.7									
HCM 6th LOS			B									

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	25	19	1176	71	33	1134
Future Volume (veh/h)	25	19	1176	71	33	1134
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1885	1900	1885	1885	1885	1885
Adj Flow Rate, veh/h	27	21	1278	77	36	1233
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	0	1	1	1	1
Cap, veh/h	0	0	2756	166	593	2876
Arrive On Green	0.00	0.00	0.80	0.80	0.80	0.80
Sat Flow, veh/h	0	0	3527	206	405	3676
Grp Volume(v), veh/h	0	0	666	689	36	1233
Grp Sat Flow(s),veh/h/ln	0	0	1791	1848	405	1791
Q Serve(g_s), s	0.0	0.0	2.7	2.7	0.7	2.4
Cycle Q Clear(g_c), s	0.0	0.0	2.7	2.7	3.4	2.4
Prop In Lane	0.00	0.00		0.11	1.00	
Lane Grp Cap(c), veh/h	0	0	1438	1484	593	2876
V/C Ratio(X)	0.00	0.00	0.46	0.46	0.06	0.43
Avail Cap(c_a), veh/h	0	0	4823	4977	1359	9646
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.7	0.7	1.2	0.7
Incr Delay (d2), s/veh	0.0	0.0	0.2	0.2	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.1	0.1	0.0	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	0.0	0.9	0.9	1.3	0.8
LnGrp LOS	A	A	A	A	A	A
Approach Vol, veh/h	0		1355			1269
Approach Delay, s/veh	0.0		0.9			0.8
Approach LOS			A			A

Timer - Assigned Phs	2	6	8
Phs Duration (G+Y+Rc), s	22.8	22.8	0.0
Change Period (Y+Rc), s	4.5	4.5	4.5
Max Green Setting (Gmax), s	61.5	61.5	19.5
Max Q Clear Time (g_c+I1), s	4.7	5.4	0.0
Green Ext Time (p_c), s	12.4	13.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	0.9
HCM 6th LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	82	191	1015	139	248	951
Future Volume (veh/h)	82	191	1015	139	248	951
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1900	1900	1885	1885	1885	1885
Adj Flow Rate, veh/h	89	208	1103	151	270	1034
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	1	1	1	1
Cap, veh/h	98	229	2220	303	322	2512
Arrive On Green	0.20	0.20	0.70	0.70	0.70	0.70
Sat Flow, veh/h	494	1154	3260	433	446	3676
Grp Volume(v), veh/h	298	0	623	631	270	1034
Grp Sat Flow(s),veh/h/ln	1653	0	1791	1807	446	1791
Q Serve(g_s), s	15.8	0.0	14.3	14.4	48.6	10.9
Cycle Q Clear(g_c), s	15.8	0.0	14.3	14.4	63.0	10.9
Prop In Lane	0.30	0.70		0.24	1.00	
Lane Grp Cap(c), veh/h	328	0	1256	1267	322	2512
V/C Ratio(X)	0.91	0.00	0.50	0.50	0.84	0.41
Avail Cap(c_a), veh/h	331	0	1256	1267	322	2512
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	35.2	0.0	6.2	6.2	23.2	5.6
Incr Delay (d2), s/veh	27.4	0.0	0.3	0.3	17.6	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.8	0.0	4.0	4.1	7.1	3.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	62.6	0.0	6.5	6.5	40.8	5.7
LnGrp LOS	E	A	A	A	D	A
Approach Vol, veh/h	298		1254			1304
Approach Delay, s/veh	62.6		6.5			13.0
Approach LOS	E		A			B

Timer - Assigned Phs	2	6	8
Phs Duration (G+Y+Rc), s	67.5	67.5	22.3
Change Period (Y+Rc), s	4.5	4.5	4.5
Max Green Setting (Gmax), s	63.0	63.0	18.0
Max Q Clear Time (g_c+I1), s	16.4	65.0	17.8
Green Ext Time (p_c), s	10.6	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	15.3
HCM 6th LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	684	201	60	1085	4	712	135	103	3	99	17
Future Volume (veh/h)	13	684	201	60	1085	4	712	135	103	3	99	17
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	14	743	218	65	1179	4	774	147	112	3	108	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	208	1421	634	301	1421	634	1192	394	300	490	625	104
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	474	3554	1585	584	3554	1585	2454	985	750	1120	1563	260
Grp Volume(v), veh/h	14	743	218	65	1179	4	774	0	259	3	0	126
Grp Sat Flow(s),veh/h/ln	474	1777	1585	584	1777	1585	1227	0	1735	1120	0	1823
Q Serve(g_s), s	1.2	7.1	4.3	4.3	13.4	0.1	13.4	0.0	4.7	0.1	0.0	2.0
Cycle Q Clear(g_c), s	14.6	7.1	4.3	11.4	13.4	0.1	15.4	0.0	4.7	4.8	0.0	2.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.43	1.00		0.14
Lane Grp Cap(c), veh/h	208	1421	634	301	1421	634	1192	0	694	490	0	729
V/C Ratio(X)	0.07	0.52	0.34	0.22	0.83	0.01	0.65	0.00	0.37	0.01	0.00	0.17
Avail Cap(c_a), veh/h	208	1421	634	301	1421	634	1192	0	694	490	0	729
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	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.7	10.2	9.4	14.6	12.1	8.1	13.7	0.0	9.5	11.2	0.0	8.7
Incr Delay (d2), s/veh	0.6	1.4	1.5	1.6	5.7	0.0	2.7	0.0	1.5	0.0	0.0	0.5
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	0.1	1.9	1.1	0.5	4.2	0.0	3.1	0.0	1.6	0.0	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.3	11.6	10.9	16.2	17.9	8.1	16.4	0.0	11.1	11.2	0.0	9.2
LnGrp LOS	B	B	B	B	B	A	B	A	B	B	A	A
Approach Vol, veh/h		975			1248			1033			129	
Approach Delay, s/veh		11.6			17.7			15.1			9.3	
Approach LOS		B			B			B			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		17.4		16.6		6.8		15.4				
Green Ext Time (p_c), s		0.4		0.7		0.4		1.8				
Intersection Summary												
HCM 6th Ctrl Delay			14.8									
HCM 6th LOS			B									

Appendix E

Notice of Preparation

To: State Clearinghouse
State Responsible Agencies
State Trustee Agencies
Other Public Agencies
Interested Persons

From: David Brletic, Senior Planner
City of Sanger
1700 7th Street
Sanger, CA 93657

Subject: Notice of Preparation of a Draft Program Environmental Impact Report – Sanger 2035 General Plan Update and North Academy Corridor Master Plan

Project Title: 2035 Sanger General Plan

Notice is Hereby Given: The City of Sanger (City) is the Lead Agency on the below-described project and has prepared a Notice of Preparation (NOP) of a Program Environmental Impact Report (EIR), pursuant to the California Environmental Quality Act (CEQA). The complete project description, location and the potential environmental effects are contained on the following pages of this NOP. The NOP lists potentially significant environmental issues that will require detailed analysis and technical studies that will need to be prepared for the forthcoming EIR to determine the level of significance of the environmental effect resulting from implementation of the City's 2035 General Plan. The NOP is intended to disclose environmental information and to solicit the views of the public, interested parties, and/or agencies as to the scope and content of the environmental information which is germane to your agency's statutory responsibilities in connection with the proposed project. Specifically, the City is requesting that commenters provide comments on the NOP; identify additional environmental topics (and/or special studies) and alternatives that they believe need to be explored in the forthcoming EIR; and to identify other relevant environmental issues related to the scope and content of the forthcoming EIR.

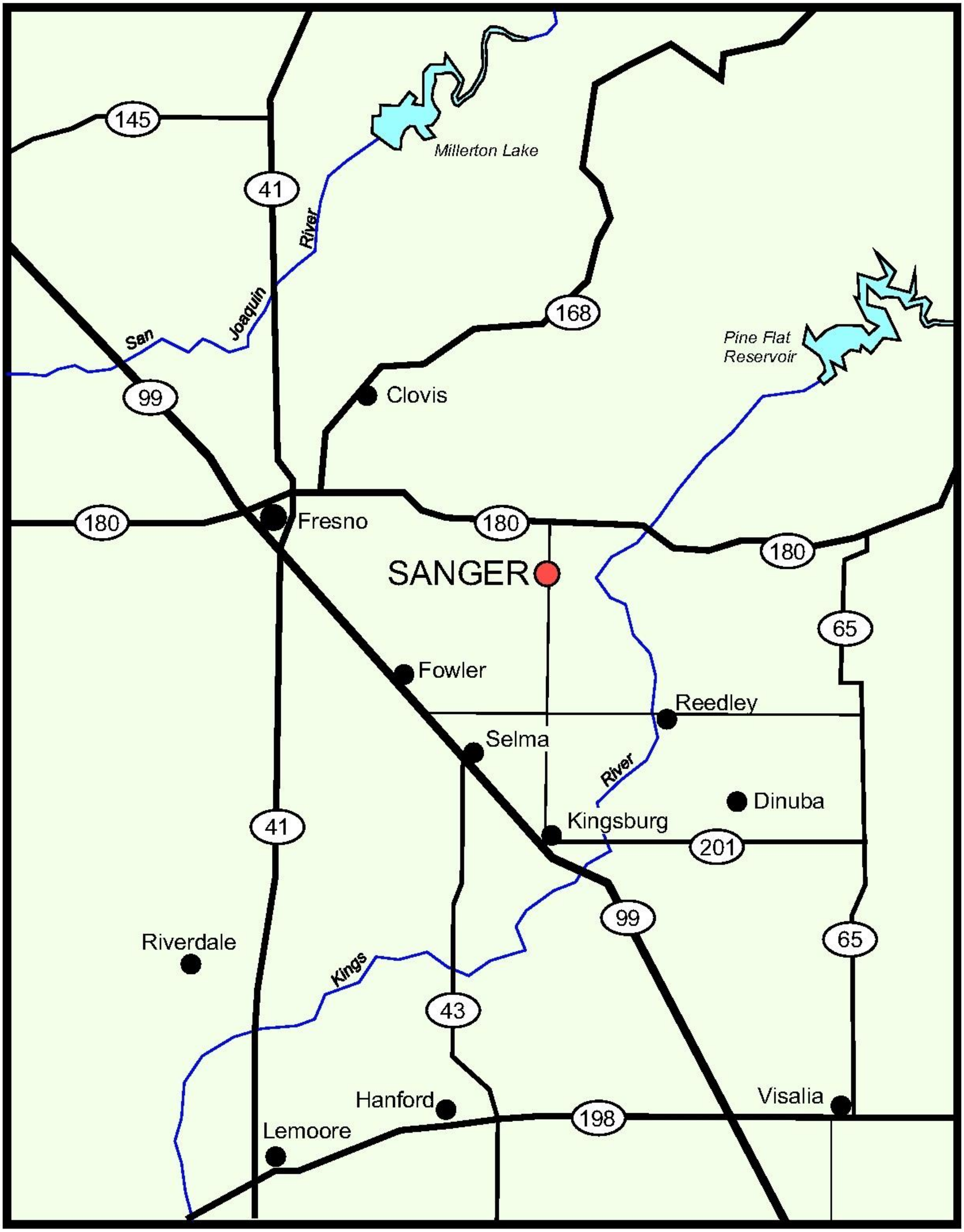
Document Availability and Public Review Timeline: Due to the time limits mandated by State law, your response to the NOP must be sent at the earliest possible date *but not later than 30 days* after receipt of this notice. The review period for the NOP will be from March 14, 2018 to April 14, 2018. Copies of the NOP can be reviewed at City Hall, 1700 7th Street, Sanger, CA 93657.

Please send your comments to David Brletic, Senior Planner at the address shown above or to DBrletic@ci.sanger.ca.us. Please provide the name and return mailing address for a contact person in your agency (if applicable).

Scoping Meeting: A scoping meeting will be conducted to collect oral comments from agencies and the public as to the scope and content of the forthcoming Draft EIR. The meeting is scheduled as follows: Wednesday, March 28th, at 5:30 p.m. in the City of Sanger Council Chambers located at 1700 7th Street, Sanger, CA 93657.

Project Location: Sanger is located in Fresno County in the eastern portion of the San Joaquin Valley. It is located south of State Route 180, an east-west highway that crosses the County and connects Mendota on the west to Sequoia/Kings Canyon National Parks on the east. The City is approximately 13 miles east of Fresno, the county seat of Fresno County. Other nearby cities include Fowler, Parlier, and Reedley. The unincorporated community of Del Rey is located 2 ½ miles southwest of Sanger. See Figure 1.

Figure 1 – Regional Map



There are two boundaries that are important with respect to the Sanger General Plan:

1. City Limits – The City controls the use and development of land within the Sanger city limits. As of January 2017, Sanger's city limits contained 3,680 acres or 5.8 square miles. The location of the City limits boundary is shown in Figure 2.

2. Sphere of Influence – The Sphere of Influence (SOI) is a line that it typically situated outside the City limits boundary and marks where the City is expected to grow (by annexations). As of January 2017, Sanger's SOI contained approximately 6,873 acres or 10.7 square miles. The location of the SOI is shown in Figure 2.

This General Plan also proposes the establishment of phased growth boundaries for Sanger. These boundaries are intended to reduce sprawl and leapfrog development by directing growth to occur in a compact and contiguous fashion. The first growth boundary is the existing 2017 City limit boundary.

The City is also including a Master Plan located on the north side of the community in this process. This area represents additional commercial development opportunities for the City which would result in sales tax and job generation. The Master Plan area generally follows the Sphere of Influence line north of the City limits and includes Highway 180 corridor between Indianola Avenue and Quality Avenue.

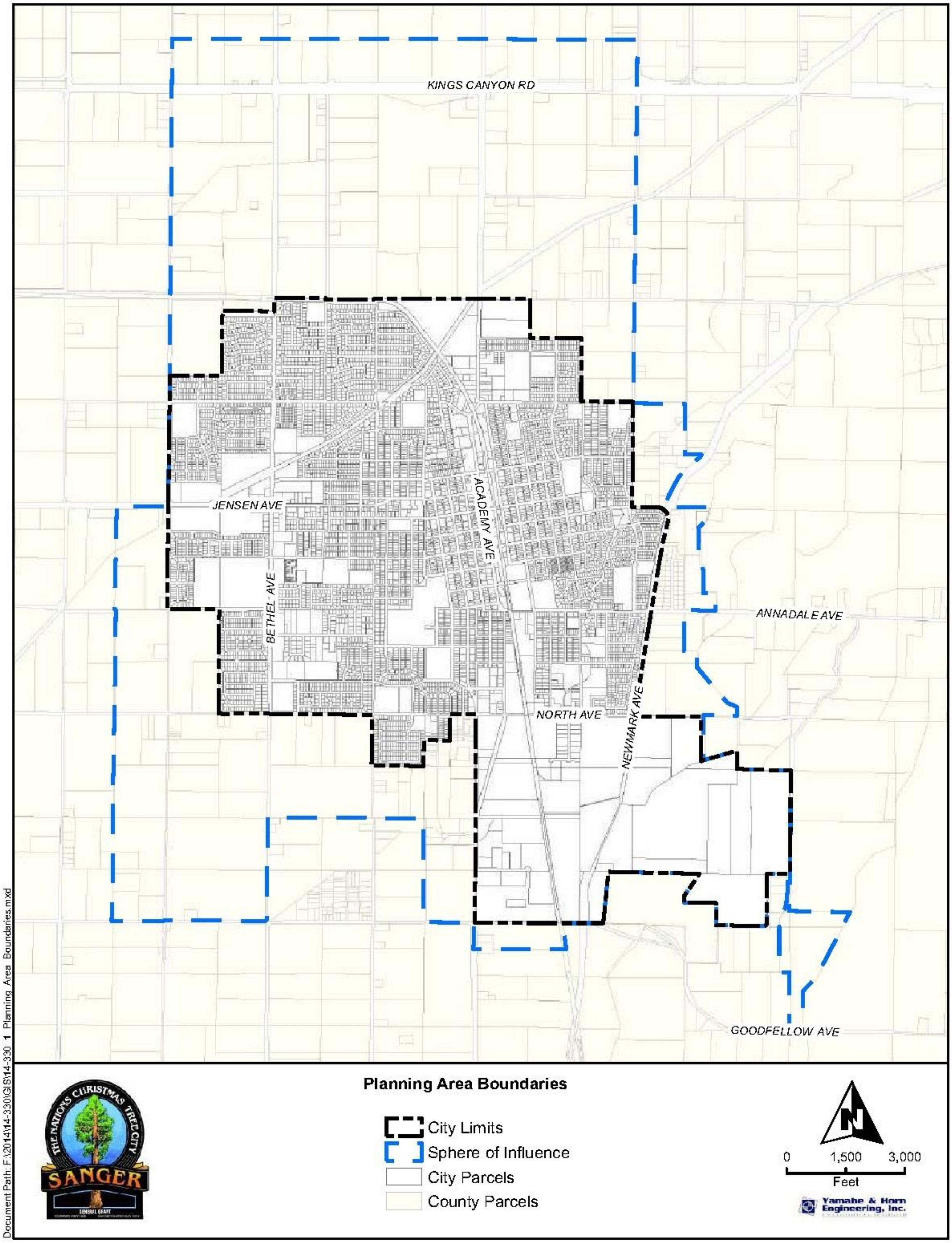
Background and History: Each California city and county is required to prepare and administer a long-term, comprehensive planning policy document that details how a city will physically develop. That process and ultimate document is called a General Plan, which contains seven mandated elements that pertain to specific aspects of the community:

- Land Use
- Circulation
- Housing
- Open Space
- Conservation
- Safety
- Noise

The City of Sanger last updated its General Plan in 2003. In 2016, the City began the process of updating its 2003 General Plan by enlisting the service of Collins & Schoettler Planning Consultants to assist in preparation of the 2035 General Plan and associated documents. Collins & Schoettler worked with the Sanger Planning Commission, who reviewed work and provided input and a series of public meetings were held to solicit input from the community. These groups worked to formulate goals, policies and objectives to guide Sanger's growth and to craft a map showing the location of future land uses in and around Sanger.

Once the General Plan and Master Plan documents have been prepared, they must be evaluated according to the California Environmental Quality Act (CEQA). This NOP document is the first step in many steps that will ultimately evaluate the General and Master Plans and their impact on the environment.

Figure 2 – City Boundaries



Project Description: The following is an overview of the 2035 General Plan.

Time Frame

The Sanger General Plan is adopted to guide growth and development through the year 2035. In order to ensure the Plan remains a meaningful document, it should undergo a comprehensive review every five years. In particular, the Plan's policies and land use map should be reviewed and adjusted as necessary to ensure they accurately reflect conditions and expectations.

General Plan Objectives

A broad set of guiding objectives, agreed upon by the City Council and Planning Commission are summarized as follows:

- Project Sanger's future growth and make provisions for this growth
- Create a unique and attractive City
- Provide a safe and pleasant living/working environment
- Promote increased sales tax revenue
- Protect and preserve natural resources
- Provide for a greater variety of housing choices and shopping opportunities
- Ensure adequate public facilities
- Ensure adequate infrastructure systems
- Enhance and revitalize downtown
- Promote economic development and enhanced employment opportunities

General Plan Contents

The General Plan is divided into two parts: The General Plan Policy Document and the Community Profile.

The General Plan Policy Document consists of the following Elements:

- Land Use – The Land Use element details how future land uses will be arranged and what form they will take.
- Circulation – The Circulation element shows where future roadways will travel and what kinds of traffic roadways will likely carry. Other modes of transportation, like bicycles, walking and transit are also considered.
- Open Space & Conservation – The Open Space/Parks & Conservation element plans for recreational needs and also sets forth policies to conserve resources, such as agricultural land and air quality.
- Housing – The Housing element includes policies and action programs to ensure that housing is provided for all of Sanger's income groups. (The Housing Element was adopted separately from this current General Plan Update process, but is part of the General Plan in its entirety).
- Safety – The Safety element establishes policies to ensure future citizens and property are as free as possible from safety hazards.

- Noise – the Noise element provides policies designed to minimize the impacts of noise on existing and future development.
- Environmental Justice – this element provides policies to minimize negative environmental impacts on low income and minority neighborhoods.

The Community Profile document includes background information on the City of Sanger and is sectioned into three parts, each with its own subsections:

- Human Environment
- Physical Environment
- Resources

Projected Growth and Land Uses Under the Proposed General Plan

Using a base year of 2015, the City of Sanger's population was 25,128 people. It is estimated that Sanger could grow to a population that ranges from 35,150 (low estimate) to 51,000 (high estimate) by the year 2035, depending on the actual growth rate. Using a "medium" growth rate, the projection results in a population of approximately 43,825 persons by 2035. This represents nearly a doubling of the community's current population. In order to strike a balance between potential low and medium growth scenarios, a "low-medium" growth rate of 1.7% per year is utilized. At a growth rate of 1.7% per year, Sanger's population is estimated to be 35,202 people in year 2035. This number is the basis of the analysis in the General Plan.

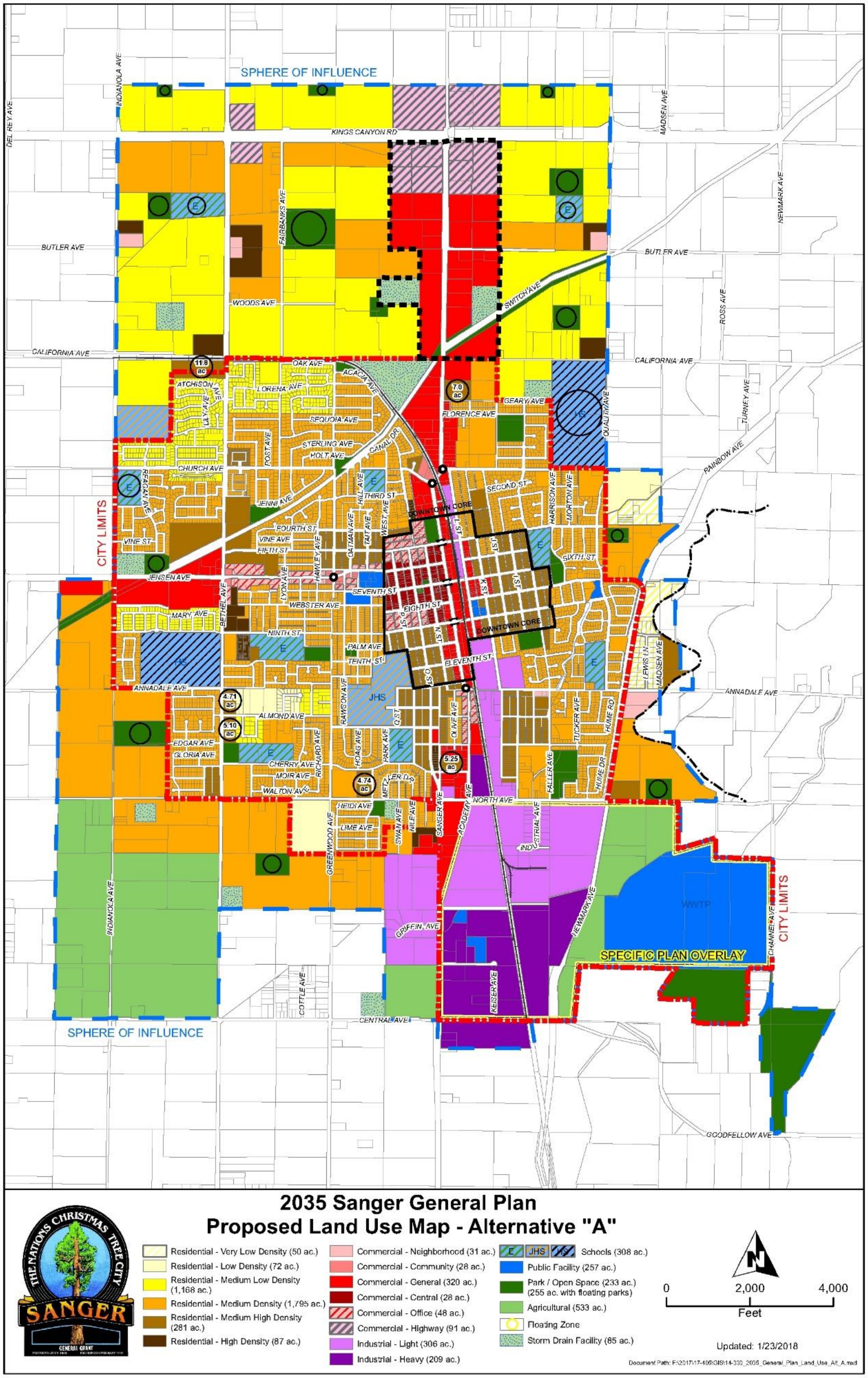
Land demand projections have been determined taking into account the City's existing undeveloped land, projected population, and other factors. Some of the existing land use designations will change during this General Plan update process, however, the City is likely to need additional lands to accommodate "full buildout" of the General Plan. Based on this analysis, it is estimated that the City will need an additional 290 acres of land as follows:

- Residential: 141 acres
- Commercial: 49 acres
- Industrial: 0 acres
- Parks: 16 acres (at 3 acres per 1,000 residents)
- Schools: 84 acres

The proposed land use map is shown in Figure 3. This map delineates where future land uses will be located in the community, through year 2035. The following generalized land use categories are established to implement the policies of the Sanger General Plan:

- Residential
- Commercial
- Industrial
- Public
- Open Space
- Agricultural / Urban Reserve

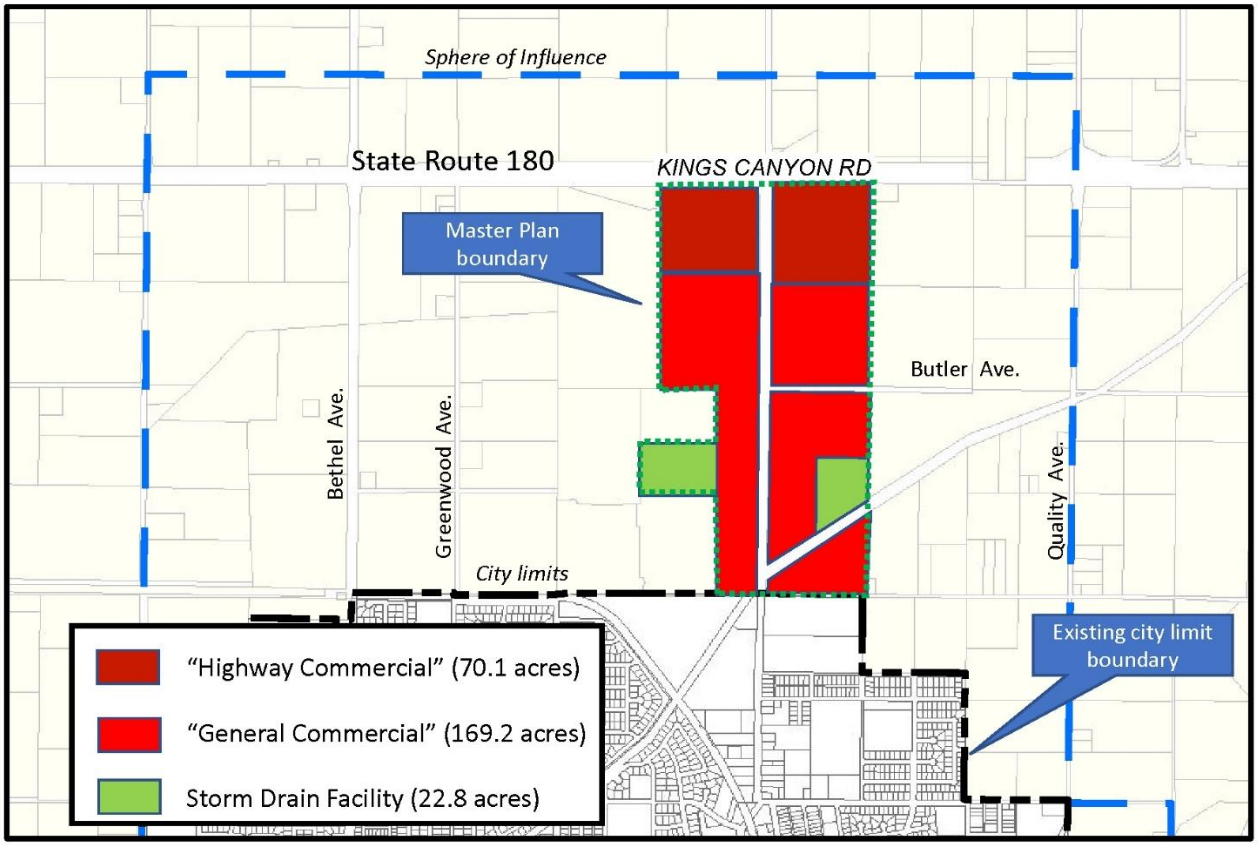
Figure 3 – Proposed General Plan Land Use Map



North Academy Corridor Master Plan

The City is also developing a Master Plan for the areas along the Academy Avenue corridor, north of the City limits within the Sphere of Influence (see Figure 4). The Master Plan encompasses approximately 253 acres and addresses specific land uses and infrastructure that will be required to help encourage development in this area, including opportunities along Highway 180.

Figure 4 – North Academy Corridor Master Plan Area



Environmental Analysis

The City, as Lead Agency, has determined that a Program Environmental Impact Report (EIR) will be required for the project as required by the California Environmental Quality Act (CEQA). The environmental assessment will utilize the most current guidelines for CEQA and for each issue area. The Draft EIR will focus on the following environmental topics:

- Aesthetics
- Agriculture and Forestry Resources
- Air Quality
- Biological Resources
- Cultural Resources
- Geology and Soils
- Greenhouse Gas Emissions
- Hazards and Hazardous Materials

- Hydrology and Water Quality
- Land Use and Planning
- Mineral Resources
- Noise
- Population and Housing
- Public Services
- Recreation
- Transportation / Traffic
- Tribal Resources
- Utilities and Service Systems

The EIR will also address Cumulative Impacts, Significant and Unavoidable Environmental Effects, Growth Inducing Effects and Project Alternatives. To support the findings of the Draft EIR, the City will prepare various technical studies including:

- Air Quality / GHG Report
- Biological Report
- Cultural Resources Report
- Noise Study
- Traffic Impact Study
- Water Supply / Water Quality Analysis

The City is also preparing an Economic Analysis to support the decisions regarding placement and amount of commercial and industrial land use designations.

Agencies and Community members can provide input at two different phases in the EIR process: in response to this NOP, and to the Draft EIR itself when that document is released. Please refer to the first page of this NOP for instructions and timelines pertaining to providing input and comments on the project.